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MATCHING USAF SILVERTAN SHADE NO. 193

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INTRODUCTION

BEFORE a contract for the production of colored textiles, plastics, or other material is awarded a producer, it is customary for a sample of the intended production to be submitted for evaluation against a standard. If the color difference between sample and standard is within certain tolerance limits, the contract may be awarded and production started. In current practice, however, the tolerance limits are seldom specified in any precise manner, yet this lack of precision works to the disadvantage of both producer and customer. On the one hand, material which is too poor a match is offered, and on the other, the producer may uselessly spend time and money for making a closer match than is required. During the past few years several studies have been undertaken to provide the basis for numerical methods which would reduce the difficulties of color tolerance specification, and the problem is now under study by a committee of the American Society for Testing Materials.

The purpose of the study reported in this paper was to examine the current practice of the United States Air Force in acceptance of submitted samples for Silvertan Shade No. 193 on wool gaberdine. Sixty-six samples of this shade, thirty of which had been accepted as suitable matches with the standard, were measured on a spectrophotometer with the purpose of determining approximate tolerances and of establishing the causes of the large number of rejections on this particular shade. Silvertan Shade No. 193 was chosen for this study because it is one which has apparently given the dyer much trouble, but the general methods used in analyzing this shade will be applicable to other colors as well. Nothing reported in this paper, however, is to be considered as an official USAF colorimetric specification or method. The conclusions reported are to be considered merely as indicative of current practice.

Although the acceptance of a dyer's submitted sample must be based not only on color but on many other physical- and color-fastness properties as well, the samples studied had been accepted or rejected with respect to color only, and it is with this property that we will be concerned. In other words, for the purposes of this study, we may assume that the dyer's samples are acceptable providing they are sufficiently close color matches with the standard in both daylight and tungsten light.

COLORIMETRIC DATA

The sixty-six submitted samples of Silvertan Shade No. 193 were measured on the General Electric Recording Spectrophotometer and calculations were made with the Automatic Tristimulus Integrator. Tristimulus data (for a description of the methods of colorimetry employed here see *(1, 2)*) and Munsell notations for the standard under CIE Illuminants C (daylight) and A (tungsten light) are given in Table I. The values for Illuminant A given in Table I were obtained by non-automatic integration of the spectrophotometric curve, but all other Illuminant A values given in this paper are based on measurements of both standard and samples with the automatic integrator and a filter in the sample beam of the spectrophotometer (3).

TABLE I
COLORIMETRIC SPECIFICATION FOR STANDARD

Illuminant	*x*	*y*	*Y*	*Munsell*	
C	.344	.350	.278	2.5Y	5.8/1.7
A	.476	.420	.287	8.0YR	5.9/9.0

R D Haire

Differences between the colorimetric values of standard and samples are given in Table II. Those samples considered acceptable on the basis of color by the USAF are indicated by the letter "A" in the column headed "Acceptability." The values given in Table II are plotted in Figures 1a and 1b for Illuminant C and in Figures 2a and 2b for Illuminant A. The samples have been divided into the a and b figures simply to prevent crowding of the plotted data. Each figure contains a chromaticity diagram, Δy vs Δx, and a diagram of the luminance factor ΔY vs Δx, with the standard located at the center

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TABLE II

DIFFERENCES IN CIE COLORIMETRIC VALUES BETWEEN SAMPLES AND STANDARD

Sample No.	Acceptability	Illuminant C			Illuminant A		
		Δx	Δy	ΔY	Δx	Δy	ΔY
1		+.0012	−.0010	−.0104	+.0022	−.0025	−.0093
2		+.0017	−.0023	−.0046	+.0066	−.0043	−.0054
3		−.0036	−.0039	−.0050	+.0004	−.0055	−.0078
4		+.0031	−.0012	−.0377	+.0056	−.0017	−.0276
5		+.0003	−.0016	+.0032	+.0047	−.0046	+.0021
6		+.0015	−.0010	−.0085	+.0053	−.0033	−.0051
7	A	+.0012	+.0004	−.0106	+.0005	+.0012	−.0075
8		+.0010	+.0002	+.0076	−.0002	+.0022	+.0099
9		+.0018	−.0001	−.0117	+.0047	−.0050	−.0084
10	A	+.0005	.0000	−.0098	.0000	+.0019	−.0078
11	A	+.0037	+.0006	−.0188	+.0026	+.0002	−.0099
12	A	−.0003	−.0003	+.0020	−.0009	+.0017	+.0033
13		−.0014	−.0043	−.0372	+.0006	−.0019	−.0267
14		+.0024	−.0001	−.0155	+.0021	−.0014	−.0090
15		+.0031	−.0002	−.0346	+.0023	−.0005	−.0246
16		+.0039	−.0013	−.0299	+.0027	+.0001	−.0222
17		−.0005	−.0035	+.0044	+.0012	−.0060	+.0012
18		+.0018	−.0029	+.0010	+.0041	−.0049	−.0006
19		+.0005	−.0032	−.0348	+.0047	+.0041	−.0225
20		.0000	−.0015	−.0196	+.0027	−.0020	−.0129
21	A	−.0006	−.0007	−.0240	+.0011	+.0016	−.0147
22	A	+.0011	+.0009	−.0129	+.0030	+.0011	−.0048
23		−.0022	−.0050	−.0015	+.0020	−.0037	+.0054
24	A	+.0015	+.0005	−.0248	+.0033	+.0010	−.0249
25	A	+.0012	−.0001	−.0132	+.0027	−.0018	−.0096
26	A	−.0027	−.0021	+.0007	−.0012	−.0011	+.0027
27	A	−.0001	−.0024	−.0199	−.0001	−.0019	−.0180
28	A	−.0001	−.0020	−.0163	+.0013	−.0022	−.0171
29	A	−.0010	+.0011	−.0097	.0000	+.0010	−.0132
30	A	+.0011	−.0013	−.0235	+.0024	−.0018	−.0210
31	A	+.0016	+.0015	−.0287	+.0007	+.0017	−.0315
32	A	+.0010	+.0005	+.0135	+.0020	−.0015	+.0102
33	A	+.0024	+.0021	−.0056	+.0030	−.0015	−.0084
34	A	+.0019	+.0012	.0000	+.0037	+.0004	−.0003
35	A	+.0018	+.0003	+.0070	+.0031	−.0012	+.0045
36	A	+.0017	+.0006	+.0081	+.0030	−.0009	+.0051
37	A	−.0001	+.0014	+.0060	+.0005	+.0013	+.0063
38	A	−.0006	−.0006	+.0162	+.0004	+.0014	+.0138
39	A	+.0016	+.0009	+.0084	+.0034	.0000	+.0060
40	A	+.0008	+.0013	+.0008	+.0018	+.0010	+.0009
41	A	+.0012	−.0005	−.0132	+.0034	−.0001	−.0129
42	A	+.0014	+.0014	−.0170	+.0027	−.0006	−.0174
43	A	.0000	+.0005	−.0149	+.0003	−.0002	−.0120
44	A	+.0014	+.0005	−.0131	+.0032	−.0003	−.0114
45	A	+.0020	+.0026	−.0077	+.0040	−.0002	−.0060
46	A	+.0012	+.0011	−.0030	+.0032	−.0004	−.0009
47		+.0003	−.0030	−.0186	+.0049	−.0042	−.0159
48	A	−.0012	+.0004	−.0006	−.0004	+.0002	+.0015
49		+.0002	−.0013	−.0113	+.0035	−.0029	−.0078
50		−.0018	−.0037	−.0004	+.0018	−.0042	+.0012
51		−.0032	−.0042	−.0246	−.0024	−.0011	−.0219
52		+.0008	−.0030	−.0330	+.0057	−.0051	−.0297
53		+.0007	−.0029	−.0304	+.0063	−.0061	−.0252
54		+.0010	−.0015	−.0468	+.0063	−.0045	−.0432
55		−.0007	−.0010	−.0142	+.0028	−.0036	−.0084
56		−.0002	−.0030	−.0174	+.0031	−.0035	−.0135
57		+.0005	−.0027	−.0542	+.0042	−.0037	−.0420
58		+.0007	−.0017	−.0361	+.0043	−.0043	−.0300
59		−.0007	−.0038	−.0128	+.0038	−.0065	−.0120
60		+.0017	−.0010	−.0151	+.0035	−.0038	−.0126
61		−.0002	−.0029	−.0236	+.0054	−.0040	−.0150
62		−.0005	−.0038	−.0226	+.0058	−.0038	−.0111
63		+.0044	+.0017	−.0155	+.0096	+.0009	−.0033
64		−.0055	−.0041	+.0197	−.0022	−.0046	+.0132
65		−.0017	−.0012	−.0272	+.0036	−.0016	−.0180
66		−.0045	−.0047	−.0152	−.0021	−.0012	−.0135

of the coordinates. These diagrams represent a plan and an elevation view of the region of CIE color space around the standard. Those samples which were accepted by the USAF are plotted as open circles, those rejected are plotted as crosses inscribed in circles.

Spectrophotometric curves are shown in Figures 3 and 4. Those given in Figure 3 are for the standard and two acceptable samples, those given in Figure 4 are typical of samples rejected because of mismatch with the standard.

DISCUSSION

To be acceptable, a sample must match the standard reasonably closely in both daylight and tungsten light, thus tolerance limits must be set up for both illuminants. The tolerance limits found in this study are shown as dashed ellipses in the Δy vs Δx diagrams of Figure 1 for Illuminant C and Figure 2 for Illuminant A. The shape and orientations of these ellipses were taken to be identical with those established by MacAdam (*4*) as representing just perceptible color differences, but the sizes were determined by the USAF acceptance ratings for the samples studied. Note that the sizes have been adjusted so that with only two significant exceptions, the samples rated acceptable are included within the ellipses for both illuminants, and the samples rejected are outside of the ellipses in one or both illuminants. For Illuminant C we find the tolerance limit to be about 1.7 times as large and for Illuminant A, about 2.5 times as large as those given by MacAdam for the corresponding chromaticities.

Although color is a three dimensional quality, we have employed ellipses rather than ellipsoids to define the tolerance limits. In setting our tolerance limits we have ignored the ΔY values for the samples. If the Δy vs Δx and ΔY vs Δx diagrams are examined together, it will be apparent that none of the samples studied were rejected because of the ΔY value. In other words, the color passers were concerned only with the chromaticity differences and accepted large variations in the lightness of the submitted samples. For this reason, we found it unnecessary to set up ellipsoids to specify the tolerance limits as used by the USAF color passers on this shade. Obviously, however, a value of ΔY could be reac'.ed where the sample would be unacceptable even though Δx and Δy were zero.

The agreement between the tolerance limits shown in Figures 1 and 2 and the judgment of the USAF color passers is remarkably good. A few minor discrepancies exist where the sample lies very close to the tolerance limits. As would be expected, a few of these samples may be called acceptable when they fall slightly outside the

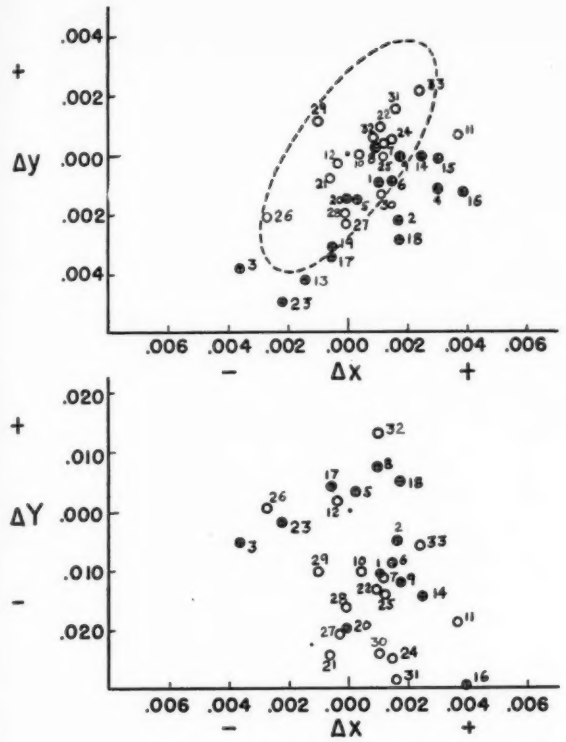

Figure 1a

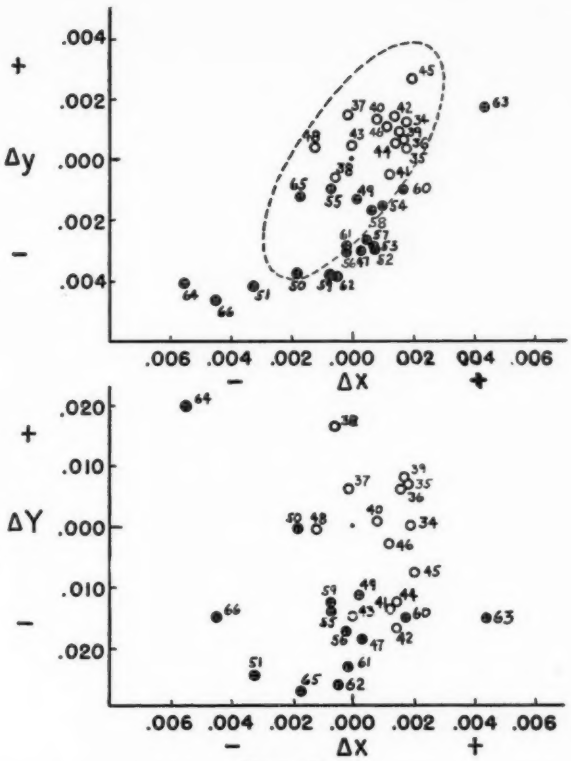

Figure 1b

Colorimetric Specifications of Samples
Illuminant C

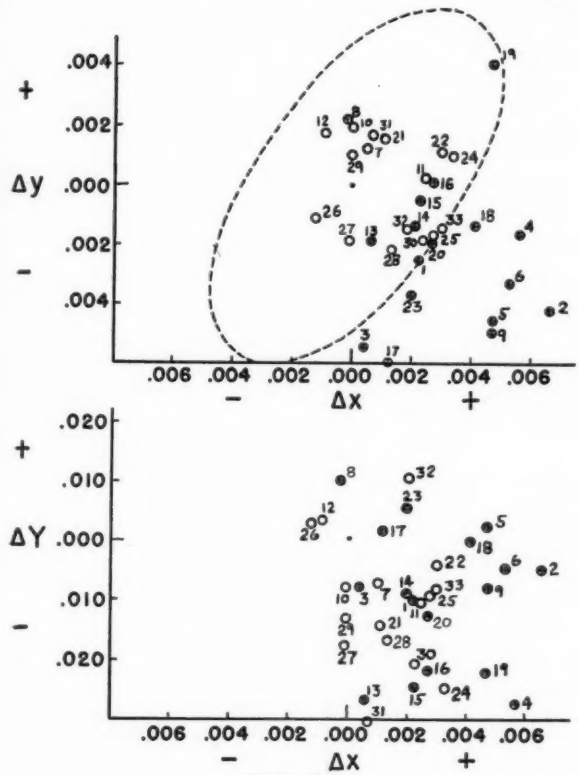

Figure 2a

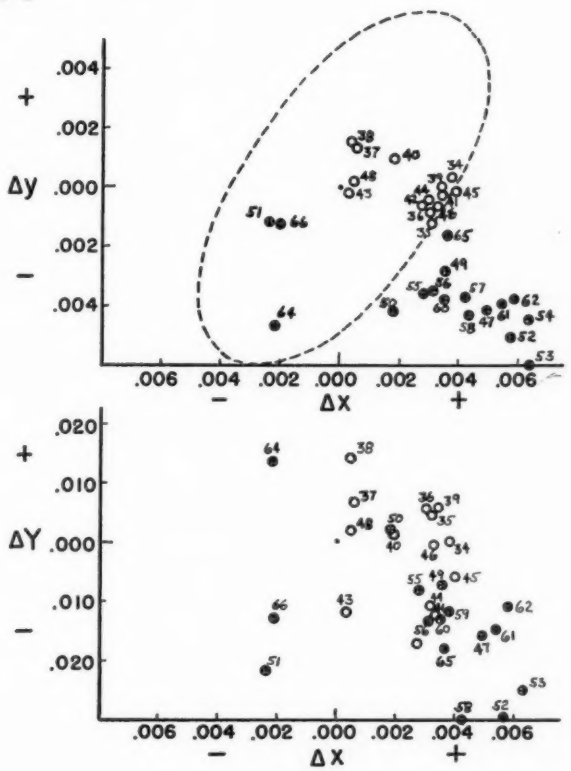

Figure 2b

Colorimetric Specifications of Samples
Illuminant C

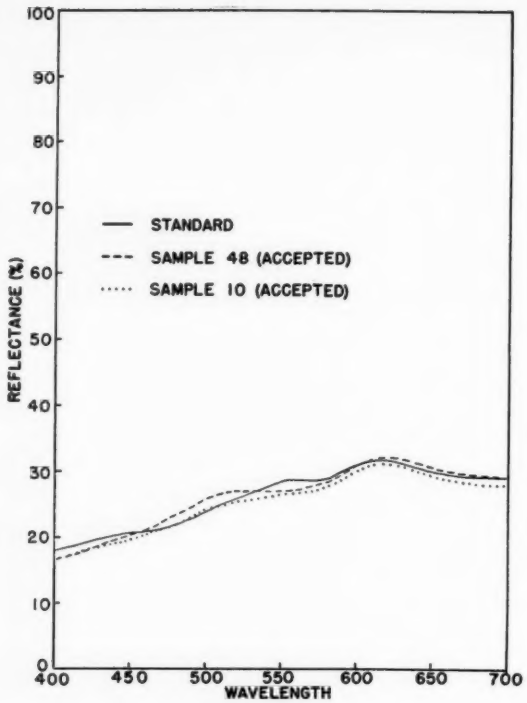

Figure 3

Spectrophotometric Curves of Standard and Acceptable Matches

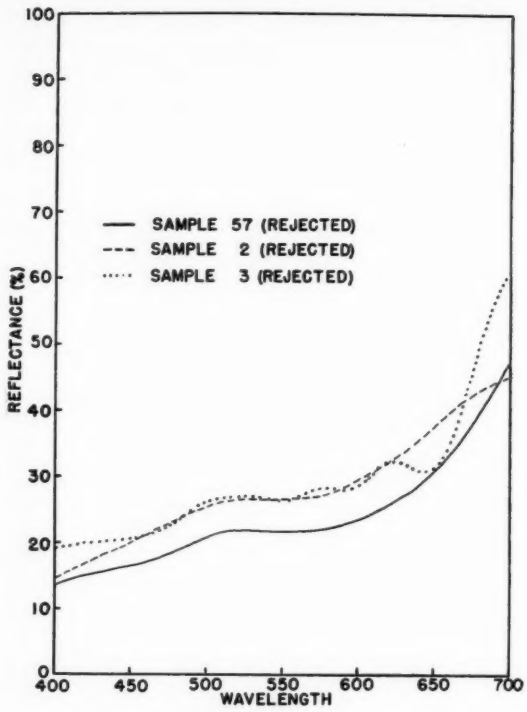

Figure 4

Spectrophotometric Curves of Rejected Sampes

limits and a few may be called unacceptable when they fall slightly inside. This occurs simply because tolerance limits cannot be precisely given in visual terms. In addition to these insignificant discrepancies, there are only two cases of disagreement between the measurements and judgments. Sample 8 was judged unacceptable even though it falls well within the ellipse for both illuminants, and Sample 11 was judged acceptable even though it falls well outside the ellipse for Illuminant C. The fact that so few discrepancies exist is proof that the USAF color passers have made their judgments very carefully and conscientiously. It also indicates the practicability of setting up numerical tolerance limits in the CIE system of colorimetry. If a sample to be submitted for appraisal is first measured and plotted in these diagrams, it will almost certainly be accepted if it has a ΔY value no greater than ± 0.02 and falls within the ellipses, and it will almost certainly be rejected if it falls outside of the ellipses for either illuminant.

Up to this point we have discussed only the results of the dyeing operation. We have discussed the color, but not how that color is produced. It is highly important, however, that dyestuffs for producing the color be properly chosen, even apart from the various fastness considerations. To assure acceptance of the sample by all observers under all conditions of illumination, it is necessary for the spectrophotometric curve of the sample to be nearly identical with that of the standard. The method of choosing the proper dyestuffs for spectrophotometric matching has been discussed elsewhere and need not be described here (5). The importance of proper choice of component dyestuffs is amply illustrated by the fact that all of the samples of Silvertan Shade No. 193 which had spectrophotometric curves similar to the standard were accepted. This means that in all cases in which the dyer chose the correct dyestuffs, his sample was accepted. In all cases except one, the spectrophotometric curves of the rejected samples had high "red tails" such as those shown in Figure 4. The one exception was similar to the standard in the red (long wavelength) end of the spectrum, but differed in other regions.

The importance of choosing the proper dyestuffs to provide a spectrophotometric curve nearly identical with the standard cannot be overemphasized. If colors are to match under all conditions of illumination they must have nearly identical curve shapes. Of course, it is often possible to adjust an incorrect combination of dyestuffs so that the resulting color will be acceptable in two illuminants even though the curve shape differs from the standard. Sample 45, having the curve shape shown in Figure 5 is an example of such an adjustment. It is apparent from Figures 1b and 2b that in this case the dyer compensated for the change of shade with change in illuminant by taking advantage of the maximum tolerance in both illuminants. If he had made an exact match in either illuminant the match in the other would have been unacceptable. That this is a dangerous procedure is illustrated by Sample 19, the curve of which is also given in Figure 5. Note from Figure 1a and 2a that the dyer attempted the same adjustment here, but failed. If in both these cases the correct components had been used, there would have been no necessity to attempt correction by use of the maximum allowable tolerances.

Spectrophotometric curves, unless they are identical for the sample and the standard, cannot be used alone to determine the acceptability of the sample. This is best illustrated by the curves for Sample 3 (Figure 4), Sample 8 (Figure 5) and the standard (Figure 3). The curves for Sample 3 and Sample 8 both are noticeably different from the curve for the standard and both have high "red tails." Both Sample 3 and Sample 8 were rejected visually by the USAF color passers whereas Sample 8 would have been accepted on the basis of measurements. Due to Sample 8 being a metameric match, some observers would see the color difference between it and the standard as small and would agree with the measurements in accepting the sample, while other observers, whose color vision differs only slightly from the "stand-

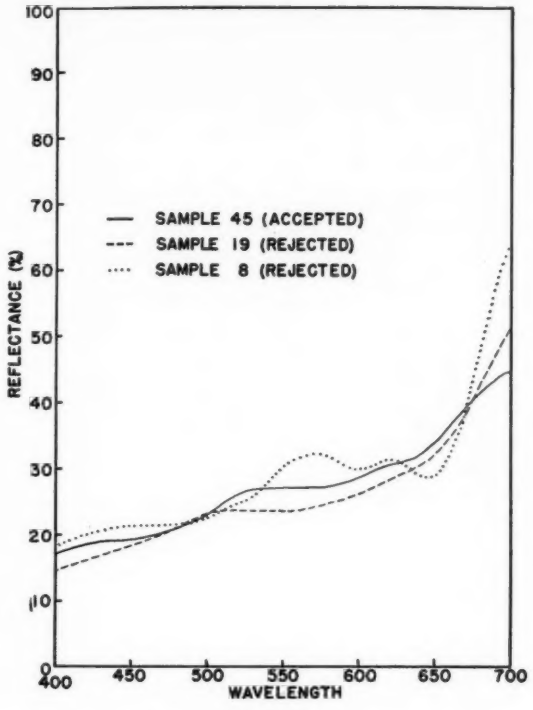

Figure 5
Spectrophotometric Curves of Samples 45, 19 and 8

ard observer," would see the color difference as large and would agree with the USAF color passers in rejecting the sample. This difficulty can be overcome simply by choice of proper dyestuffs so as to match the spectrophotometric curve of the standard. If the curves for the sample and for the standard are identical, all observers, even those with highly abnormal vision, will see a color match under all conditions of illumination.

CONCLUSIONS

We have shown that if a sample of USAF Silvertan Shade No. 193 examined under daylight illumination lies well within an ellipse about 1.7 times as large as the MacAdam visual sensitivity ellipse, if it lies well within an ellipse about 2.5 times as large as the visual sensitivity ellipse when viewed under tungsten light, if it does not differ from the standard in Y value by more than about ±0.02, and if its spectrophotometric curve is nearly identical in shape with that of the standard, it will be accepted as a color match with the standard. If it fails in any one of these specifications it may be rejected. Although it is possible to have a sample accepted even though its curve shape differs from that of the standard, the dangers of such metameric matches have been pointed out. Improper choice of dyestuffs is apparently the most important cause of rejection on this shade. Much time and money could have been saved by the various manufacturers if they had obtained spectrophotometric measurements on the standard and the dyestuffs they proposed using before attempting to make the match.

Finally, it should be noted again that the measurements and specifications reported herein do not constitute official USAF standards and are to be used as a guide only. In their general aspects, however, we consider the methods reported here to be applicable to all shade matching problems.

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ABSTRACTS

The Felting in Laundering of Wool Blends

H Bogarty, A M Sookne, L I Weiner and M Harris, *Textile Research J* 23, 114-18, February, 1953.

The introduction of many new fibers in recent years has stimulated widespread interest in blends and in research on the effect of blending on fabric properties and processing. For example, it is well known that the addition of a nonwool component affects the felting behavior of wool fabrics, especially with respect to the fulling process. While the behavior of blended fabrics in laundering might be expected to follow similar patterns, it was considered of interest to investigate the consequences of the blending of various fibers with wool on the shrinkage of the resulting fabrics in laundering. This work constituted a part of the Army Quartermaster program on the shrink-resistance of wool for military clothing.

Following is a summary of the results obtained:

1) The shrinkage in laundering of knitted samples containing wool blended with varying amounts of nylon, Vicara, and viscose was studied. The nylon acts as a true diluent, the felting decreasing as the proportion of nylon in the blend increases. The addition of viscose tends to increase the feltability in the construction studied, even when half the fiber is viscose. The Vicara blends are intermediate in behavior.
2) The diverse behavior of the various fibers when blended with wool may be expected by the plastic nature of their surfaces, and by the relative ease with which the fibers are bent and twisted in laundering. Those fibers which are easily deformed by the stresses encountered in the felting process (e g, viscose) do not inhibit shrinkage in blends, and may enhance it by providing a soft bearing surface for neighboring wool fibers. The felting of such blends may be decreased by decreasing the swellability of the nonwool component by means of a cross-linking treatment. Blends with nylon, which are low in feltability due to the relative difficulty with which this fiber is deformed, may be made to felt more easily by the use of swelling agents such as cresol.
3) Staple length is shown to affect the feltability of wool considerably. A fabric made from short-staple wool became thick and boardy in laundering, although this was not accompanied by the usual large changes in linear dimensions.—WHC

The Prevention of Odors in Fabrics Which Have Been Resin-treated

I. A Fluck *et al*, *Canadian Textile J* 69, 59-63, December 19, 1952.

The thermosetting aminoplastics, such as urea- and melamine-formaldehyde resins, impart to fabrics durable properties, such as shrinkage control, crease resistance, and full hand. These resins also have many desirable properties including water solubility, ease of application, and low cost. For these reasons they have become firmly established in the trade for finishing fabrics.

Fabrics treated with these resins, however, have the defect of developing unpleasant odors under certain conditions. These odors have been described as fishy, rancid, glue-like or just unpleasant. There has been a pressing need for an understanding of how the odors are formed and for an inexpensive, reliable method of preventing them.

One of the generally accepted hypotheses advanced to explain the development of odor was the formation of amines from the thermal decomposition of the nitrogen-containing resins during the high-temperature curing operation. The investigation made by the present authors, which is described in detail, has led to a different hypothesis, which in turn has suggested methods of preventing odor formation that have appeared to be successful.

The following considerations are important in planning and setting up the various mill operatoins for resin treatment of fabric:

1) The drying, after impregnation of the fabric with the resin solution, should be carried out with good air exhaustion to prevent excessive humidity build-up in the dryer.
2) The curing of the dried goods should be carried out for the minimum length of time at a temperature that gives good fabric properties.
3) The washing operations after drying and curing should be carried out with careful maintenance of the pH of the solutions used to ensure complete neutralization of the fabric.
4) The final drying after washing should be just sufficient to dry the cloth.
5) The use of ammonia, ammonium salts, formic acid, and its salts should be avoided wherever possible, and non-ammoniacal catalysts should be used in place of ammoniacal catalysts if there is any likelihood of odor development.

Finally, the authors recommend the addition of dicyandiamide or urea to the resin, to react with any formaldehyde released during drying and curing and prevent it from reacting with ammonium compounds to form amines.

The authors also describe two sensitive and reproducible tests for odor in a fabric.—WHC

Color Choice in Screen Printing

A S P, *Dyer* 107, 633-4, 811-13, 959-61, May 2 and 30, June 27, 1952.

Natural Silk. Basic dyes were once very popular, but nowadays acid dyes are used, and where fastness to light and wet treatment is necessary, premetallized dyes. For discharge work, the dischargeable acid dyes are used. Only those vat dyes which can be printed with low alkali content should be chosen, so as not to damage the silk. Indigosol dyes can be applied by either the lead chromate or the steam process. Rapidogens are not popular with screen printers because of the caustic soda, which can easily damage the screens and the fabric.

Wool. Acid and premetallized dyes are in common use. Discharging with sulfoxylate-formaldehyde causes damage to wool, but the writer states that a new organic reducing agent, formamidine sulfinic acid, can be used for discharges with no fiber damage. Vat dyes are little used, but Indigosols can be successfully applied, as on silk.

Viscose. A high percentage of all screen printed goods consists partly or entirely of viscose rayon. Direct and acid colors are widely used. The fastness to water is improved by quaternary ammonium compounds, but the light fastness is impaired. An after-treatment with certain resins greatly improves the fastness to soaping. Also special "fixers," such as "Cuprofix," will improve the fastness to light and soaping of selected direct dyes.

Screen printing with vat dyes is more difficult than roller printing, due to the peculiarity of the screen-printing technique. The writer recommends selecting only those vat dyes that are not too sensitive to variations in the steaming conditions.

The Indigosols offer great advantages to the screen printer, but they are expensive, and some are readily over-oxidized. The insoluble azo dyes are not very popular with screen printers on account of their strong alkalinity. The writer states that, by the use of Developer N (diethylaminoethanol) in place of caustic soda, this trouble is avoided and the prints may be developed in neutral steam.

For discharge styles, direct dyes are used that can be diazotized and developed or after-treated with quaternary ammonium compounds. The former are preferred. For faster colors, dischargeable vat or azoic dyes are recommended, and vat dyes for color discharges.

Acetate Rayon. The insoluble and water-soluble dispersed dyes are of special interest. Dyes which tend to sublime should be avoided. Acetate dyes which are sensitive to "gas-fading" can be protected by addition of certain inhibitors to the print paste. Acid and premetallized dyes, or even vat dyes, can be printed on acetate in the presence of suitable swelling agents. Vat dyes applied by the usual reduction method will saponify the acetate.

Nylon. The dispersed acetate dyes are ordinarily used, as well as acid dyes of the milling type and some of the premetallized dyes.—WHC

The Nonionic Auxiliary Products

R S Mayston, *Textile J Australia* 27, 947-8, October, 1952.

Nonionic auxiliaries are produced by reacting ethylene oxide with suitable compounds containing an active hydrogen atom. The commercial products today employ for this purpose either a fatty alcohol or an alkyl phenol.

The number of molecules of ethylene oxide determines to a large degree the properties of the product. Thus, increased solubility in water is generally achieved by lengthening the ethylene oxide chain, such compounds being suitable at elevated temperatures, e g, wool dyebath assistants. For low temperatures, wool-scouring products with a shorter chain (5-10 molecules) are more usual. An unusual property of all these compounds is their decreasing solubility with increased temperature.

Nonionic products have been shown to give excellent results in the scouring of both protein and cellulose fibers. Particular success has been obtained in scouring out the mineral-based oils presently in use in the worsted industry. These oils are somewhat difficult to scour out with soap and soda, but respond excellently to neutral scouring with a nonionic product. If pieces are encountered having heavy oil stains too numerous for hand spotting, then use may be made of the decreased solubility of the short-chain products at elevated temperatures to remove these stains from the piece.

A closely related phenomenon to scouring is wetting ability, and the nonionics are outstanding in this property. In desizing, for example, they exhibit excellent wetting power and negligible affinity for the fiber, and have no deleterious effect on the enzymes normally used for such purposes.

When scouring nylon or similar fibers, which subsequently have to be dyed with sulfonated dyestuffs, e g, acid, direct, or chrome dyes, it is advisable to scour with nonionic products. If a sulfated detergent is used, absorption of the detergent on the limited number of dye sites in the fiber is liable to occur, with consequent lowering of the saturation point for dye-

stuffs in dyeing; i e, only pale shades are possible, the detergent acting as a resist for the dye.

In acid milling also, the nonionics should be used as lubricants in preference to anionic compounds such as sulfated fatty alcohol or an alkyl aryl sulfonate.

The long-chain nonionics are used as restraining agents in vat dyeing, and assist in the removal of excess dye when necessary. They are also employed as dispersing agents to improve the fastness to rubbing of naphthol dyes.

On wool, they are useful assistants in dyeing with premetallized acid dyes, as the amount of acid required can thereby be materially reduced. Dyeing with the milling type of acid dyes is also improved by the addition of a nonionic.

In recent times considerable use has been made of positively charged resin dispersions as finishing agents. It is at once obvious that any anionic compound left or added in the system will result in incompatibility and precipitation of the resin. To obviate such trouble, it is safer to use only nonionic products throughout the processing.

The problem of static charges in connection with the new synthetic fibers can be overcome to a considerable extent by applying a nonionic product in the last wet process prior to dyeing.—WHC

Dyer-Printer Liaison

Anon, *Dyer* **108**, 859-61, December 12, 1952.

The dyer is frequently called upon to prepare fabrics for printing. Discharge styles most commonly concern both the dyer and the printer, and it is only after much propaganda by the printer that it has become generally accepted that effective scouring before dyeing and efficient washing afterwards are essential to produce good discharge whites and clear peg colors.

It is also recognized that the dyer frequently has difficulty in obtaining a full range of dischargeable dyes with the requisite brightness and wash and light fastness. It is not so generally recognized that, in some cases, after-treatments to improve fastness properties reduce the dischargeability of the dyed ground. Before using such processes as diazotizing and developing, insolubilization by the use of fixatives, and the formation of metal complexes, their effect on the dischargeability of the dyed ground should be checked.

Similarly, general mild contamination of the fabric with metals, from metal heating or water pipes, etc, should be avoided, owing to the danger of the formation of insoluble colored metal sulfides.

A common practice of the dyer that disconcerts the printer unless he is informed is that of washing-off in a brine solution; such practices ultimately lead to trouble.

Generally, the dyer should leave the fabric in as pure a condition as possible. An exception to this rule may be the use of agents to give a degree of stiffening to prevent curling of certain types of fabrics, particularly knitted fabrics. Substances used for this purpose include water-soluble cellulose ethers and starches. They also serve the purpose of temporarily taking the springiness out of fabrics, and enabling those for screen and block printing to be more easily laid on the table.

In some cases, when good penetration of print is required, some assistance can be obtained by hot tenter drying immediately before printing. Conversely, if the print is required to stand on the surface, the fabric should be fully conditioned or overconditioned. A further method of keeping the print paste on the surface is based on calendering the damp fabrics before printing.—WHC

The Sorption of Synthetic Surface-Active Compounds by Textile Fibers

A S Weatehrburn and C H Bayley, *Textile Research J* **22**, 797-804, December, 1952.

Data are given relating to the sorption of a variety of surface-active compounds from aqueous solution by cotton, viscose rayon, acetate rayon, nylon, and wool fibers. In general, cationic compounds were found to be sorbed to the greatest extent and nonionic compounds the least, the anionic compounds occupying an intermediate position. The addition of sodium sulfate to solutions of sodium alkyl sulfates resulted in an increase in the sorption of the latter compounds in every case. The sorption of nonionic di-isobutyl cresol-ethylene oxide compounds was found to decrease slightly with increasing length of the polyethylene oxide chain over the range studied. Sorption is attributed primarily to the hydrophilic-hydrophobic nature of the surface-active molecules on ions, micelles taking little part in the sorption process; there is some evidence, however, that positively charged micelles of cationic compounds are sorbed to a slight extent. The degree of sorption may also be influenced by superimposed effects of electrostatic interaction, electrophoretic charges, and the presence of chemically reactive groups in the fibers. Wide variations were found in the sorption capacities of the different fibers, and the arrangement of the fibers in order of increasing sorption varied with each type of surface-active compound studied.—WHC

Turkey Red Dyeing in Scotland: Its Heyday and Decline

R A Peel, *J Soc Dyers Colourists* **68**, 496-505, December, 1952.

(Abstractor's note: While the full text of this historical article is too long for reproduction here, the detailed process for dyeing the celebrated Turkey Red, as carried on in Scotland about 1790, should be of interest to many of our readers. It was extracted by Mr Peel from the *Philosophical Magazine* **18**, 43, 1804.)

Account of Process followed by M Pierre Jacques Papillon for dyeing Turkey Red.

It is now some years since M Papillon established a dyehouse at Glasgow for dyeing cotton yarn Turkey Red or Adrianople Red. . . . In the year 1790 The Commissioners and Trustees for Manufacturers in Scotland paid a premium to M Papillon for communicating to the late Dr Black, then Professor of Chemistry, Edinburgh, a description of his process, on condition that it should not be divulged for a certain term of years. These now being expired—the process is published."

Papillon's Process

(abridged)

Step I or Cleaning Operation. For 100 lb of cotton take 100 lb of Alicante barilla*, 20 lbs of pearl ash, 100 lbs of quicklime. Mix the barilla with soft water in a deep tub having a small hole near its bottom which is to be stopped at first with a peg, but covered within by a cloth supported by two bricks, in order that the ashes may be hindered from either running through the hole or choking it, while the ley filters through it. Under this tub another is to be placed to receive the ley, and pure water is to be repeatedly passed through the first tub to form leys of different strength, which are to be kept until their strength has been examined. The strongest required for use must swim or float an egg, and is called the ley of six degrees of the French hydrometer or "pese-liqueur."

Step II. Bainbie or Gray Steep. Take a sufficient quantity (ten pails) of the strong barilla water in a tub, and dissolve or dilute in it two pailsful of sheep's dung. Then pour into it 2 quart bottles of oil of vitriol, 1 lb of gum arabic and 1 lb of salammoniac, both dissolved in a sufficient quantity of weak barilla water. Lastly 25 lbs of olive oil well mixed with weak barilla water. Tramp, steep 24 hours, wring, dry, do this three times in all.

Step III. The White Steep. Exactly as above but omit the dung.

*According to Webster, an impure sodium carbonate made from the ashes of plants of the genus salsola.

Step IV. Gall Steep. Steep 24 hours in galls solution (milk warm).

Step V. First Alum Steep. 25 lbs Roman Alum and strong barilla solution, 24 hours steep—dry.

Step VI. Second Alum Steep. As last but after drying, steep six hours in river. Then wash and dry.

Step VII. Dyeing Steep. Cotton yarn dyed 10 lb at once, 2½ gallons ox-blood, 28 pails milk-warm water, stir it well, then add 25 lbs of madder and stir all well together—add yarn on stick, raise temperature over 1 hour to boil; boil 1 hour, wash and dry.

Step VIII. The Fixing Steep. Alkali and dung, steep 6 hours, wring, and dry.

Step IX. Brightening Steep. 10 lbs of white soap must be dissolved most carefully and completely in 18 pails of warm water. If any little bits of the soap remain undissolved they will make spots on the cotton. Add four pails of strong barilla water—sink the cotton; cover with cross stocks. Boil gently two hours, wash well and dry. . . . The vessels required were four round coppers and a number of tubs of firwood, hooped with wood or copper. Not even a nail of iron.—WHC

Discolorations in Some Dyed Acetate Rayons Due to Moisture Plus Solvent Effect in Dry-Cleaning and Waterproofing

C H Bayley and A S Tweedie, *Textile J Australia* 27, 998-1000, November, 1952 (from Tech Bull, Canadian Research Inst of Launderers and Cleaners).

Although this type of discoloration is not new, it is of relatively recent discovery, and hence a review of its causes and the means of preventing its occurrence in the dry-cleaning plant may prove helpful.

In the last nine months of 1951, this laboratory examined 50 garments, in grey, fawn, tan and brown shades, which showed the development of bluish or greenish areas after dry-cleaning or waterproofing treatments. In all the cases examined, the color damage was found to be due to loss of a red or brown tint from the mixture of dyes used to produce the original color in acetate rayon yarns present in the fabrics.

The loss of this red or brown tint occurred when areas of the fabric picked up free moisture during dry-cleaning or waterproofing, or if the fabric contained wet areas, e g, as from spotting operations, when it was placed in the dry-cleaning wheel or waterproofing bath. In all these cases the color change could be duplicated by taking a small piece of the fabric from a seam, or other concealed part of the garment, wetting it with water and allowing it to soak in the cleaning solvent.

Not all red or brown dyes on acetate rayon will behave in this way, but certain ones have this property. These apparently have been used chiefly in mixtures with other dyes to produce certain shades, although it has been observed that one red acetate rayon raincoat, which lost some of its color in this way, developed lighter, pink areas.

About one-third of the garments with this type of discoloration were raincoats and sport jackets containing acetate rayon. Some of these showed the typical straight-edge outlines characteristic of contact with free moisture in the waterproofing bath. The remainder of the garments were dresses, skirts, trousers, etc. In many of these, and in some of the raincoats, the appearance and location of the discolorations, or the information accompanying the damaged garment, indicated that the color damage occurred during dry-cleaning after prespotting with moisture, or when a garment had been recleaned after steam-spotting or other wet-spotting treatments. In some cases the actual amount of red or brown dye removed was extremely small, but sufficient to change the shade.

To Avoid Color Damage of This Type

1) Make sure that the moisture has evaporated from steam-spotted, or other wet-spotted areas of garments before placing them in the dry-cleaning wheel or waterproofing bath.
2) Check solvent and detergent stock solution regularly to ensure that no free water is present in the wheel.
3) Keep the temperature of the solvent in the cleaning system within the recommended limits of 75-85°F, since hot solvent gives more rapid loss of color from damp acetate rayon.
4) If garments are to be waterproofed in a standing bath with a solvent-soluble type of waterproofing compound, check this bath regularly to make sure there is no accumulation of water in it. If it is heated by a steam coil, make sure there are no leaks in the coil or its connections through which steam or condensate can escape into the contents of the bath.

Don't let garments containing acetate rayon soak in the waterproofing bath for prolonged periods (i e, overnight), since the degree of color loss from moist areas increases with time as do the chances of contact with moisture from a slow leak in the steam coil. Only a few minutes' immersion is necessary.

Don't let the temperature of the waterproofing bath exceed 100°F. A maximum temperature of 90°F is even safer if the chosen waterproofing compound can be used satisfactorily at this temperature.—WHC

Book Reviews

Economics of American Manufacturing

Edward L Allen;
Henry Holt & Co,
New York, N Y (1952)

IN THIS excellent text, the author breaks U S manufacturing down into five major groups: Basic Metals, Basic Nonmetallic Products, Metalworking, Textiles and Leather, and Consumers' Goods. Within each of these areas, he gives a concise and authoritative presentation of such factors as the industry's setting in the economy, its structure, financial factors, and future outlook. Combining the best elements of those texts which deal with the economics of our industrial system and those which cover specific fields of manufacturing in detail, Mr Allen's book offers both the instructor and the student an unusually sound overall view of our industry and its place in both national and international economics.

A comprehensive bibliography is provided for each chapter as an appendix to the last chapter which bears the title, "Sources of Data on Manufacturing Industries."—J R R

Communication of Technical Information

Robert M Dederich;
Chemonomics, Inc,
New York, N Y (1952)

CURRENT literature abounds with good manuals for writing reports, for making conferences more profitable, and for making communication within industrial organizations more effective. Mr Dederich's book does much more than simply adding another worthwhile publication to that imposing array. Small, concise, and highly readable, his book emphasizes the thinking and logic which must be present in the transmission of information from technical personnel to operating executives through the use of both written and oral media. In simple, hard-hitting terms, the author points the way to the bridging of the gaps between the knowledge, interests, and language of the technical man and the management executive.

Although we are prone to stress the value of many texts as "must" reading for the industrialist and his line and staff personnel, Mr Dederich's book certainly warrants that classification.—J R R

First of a Series—

CHLORINE RETENTION IN TEXTILE FINISHES

ARTHUR H WACHTER
American Viscose Corp

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INTRODUCTION

THE need for a satisfactory test for chlorine-retentive properties of textile finishes has prompted the study covered by this report. Numerous fabrics with resin finishes that retain chlorine during the laundry operation have found their way into the laboratories of the authors for examination as to the cause of fabric tendering. Since chlorine is used widely both in commercial and home laundering, the need for devising a chlorine retention test for textile fabrics, which will simulate laundering procedures and use conditions, becomes apparent.

The chief objectives of this study are the following:

a) To find the extent of strength losses in resin-finished rayon fabrics when given repeated launderings in a commercial washwheel by a standard washing procedure involving a low concentration of chlorine, with and without alternate pressing and light exposure.

b) To compare the results of the laundry tests with those of an accelerated chlorine retention test, involving a high chlorine concentration.

PLAN OF PROCEDURE

The experimental textiles of this study were seven rayon fabrics representing a wide variety of weights and weaves, all finished with a melamine-formaldehyde resin finish. The initial dry and wet bursting and breaking strength values are shown in Table I.

COMMERCIAL LAUNDRY TRAILS ——The following low-temperature laundry formula was repeated 25 successive times in a 40″ x 37″ commercial washwheel. The tests indicated in Tables II and III were made in each case following the number of repetitions designated.

SUDS BATH

Time (minutes)	*Temp (°F)*	*Reagents*
5	90	About 0.2% built soap (2.1 neutral soap and sodium carbonate), zeolite-softened water
5	100	Same
5	100	Same plus sodium hypochlorite to yield 0.008% available chlorine

* Present Address: Bureau of Human Nutrition and Home Economics, United States Department of Agriculture, Washington, D C.

This is the first in a series of reports on chlorine retention by textile finishes, sponsored by the American Viscose Corporation through a fellowship conducted at the Ellen H Richards Institute, School of Chemistry and Physics, The Pennsylvania State College.

RINSES

Time (minutes)	*Temp (°F)*	*Reagents*
3	100	Zeolite-softened water
3	100	Zeolite-softened water
3	100	Zeolite-softened water
5	Room temp	Commercial souring agent to give pH 6.0-6.5 and zeolite-softened water (Note: This step was omitted after the 10th washing because the chlorine retained by the fabric reacted unfavorably with the souring agent)

PRESSING TRIALS —— One pressing treatment involved a three-minute hand ironing with an electric hand iron set for rayons. The fabrics were air dried before pressing.

In the trials involving laundering and pressing, one group of fabrics was laundered and pressed, with the pressings beginning with the eleventh washing. The strength loss results were compared with fabrics which were laundered only.

EXPOSURE IN FADE-OMETER —— In the treatments which included exposure to light in a Fade-Ometer, the F D A R type was employed. Exposures were made on fabrics which had not been laundered and on those which had been given 25 repeated washings.

ACCELERATED CHLORINE RETENTION TRIALS——Test samples were immersed in a sodium hypochlorite solution containing 0.13 per cent available chlorine at 140° F for 10 minutes, rinsed thoroughly, ironed dry, and stripped to the original fabric one-inch thread count. A 30-second controlled pressing treatment at 400° followed.

This tentative method was proposed by Cluett Peabody for use in the Suter Agency Device as developed by the American Viscose Corporation.

STRENGTH TESTS —— All strength tests were made at 70° F and 65 per cent relative humidity. The extent of the strength tests was governed by the amount of fabric available. In the commercial laundering trials, bursting strength (dry and wet) and breaking strength (dry) tests served as criteria. The Mullen motor-driven tester was employed in the former and the Scott tester in the latter case. In the ravel-strip breaking strength method, which was used, the initial strips were ravelled to an exact inch, and the strips after laundering were ravelled to the initial thread count in the two directions of the fabric. The laundered specimens were tested after 1, 5, 10, 15, 20, and 25 repeated washings.

In the trials involving commercial laundering and pressing, dry-breaking-strength tests were made after 15 and 25 washings, respectively, and the designated numbers of pressings.

In the laundering and light-exposure series, dry-breaking-strength tests were made after 25 launderings with no light exposure, after 80 hours of exposure in the Fade-Ometer, and after 25 launderings followed by 80 hours of Fade-Ometer exposure.

In the accelerated chlorine-retention trials, only five of the experimental fabrics were used as designated; and dry-breaking-strength tests were made at the close of the treatment.

TABLE I

INITIAL DRY AND WET BURSTING AND BREAKING STRENGTH VALUES OF EXPERIMENTAL FABRICS

Fabric Number	*Initial Bursting Strength (pounds)*		*Initial Breaking Strength (Pounds per one-inch strip)*	
	Dry	*Wet*	*Dry, Warp*	*Dry, Filling*
1	137.0	80.5	56.6	53.1
2	88.6	51.5	60.0	27.8
3	112.2	52.2	50.5	41.2
4	83.8	50.7	45.8	45.4
5	112.8	76.3	50.4	47.0
6	111.3	76.8	56.6	51.2
7	132.2	67.5	38.7	52.7

TABLE II

STRENGTH VALUES OF EXPERIMENTAL FABRICS WASHED AT 90 to 100°F ACCORDING TO A COMMERCIAL LAUNDRY FORMULA INVOLVING 0.008 PER CENT AVAILABLE CHLORINE USED IN ONE STEP OF THE PROCEDURE

Number of Washing Treatments	*Fabric 1*		*Fabric 2*		*Fabric 3*		*Fabric 4*		*Fabric 5*		*Fabric 6*		*Fabric 7*	
Bursting Strength (lbs)														
	Dry	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*
Original fabric	137.0	80.5	88.6	51.5	112.2	52.2	83.2	50.7	112.8	76.3	111.3	76.8	132.2	67.5
After 1 laundering	137.0	70.3	82.9	49.1	111.6	47.8	98.0	50.6	131.2	74.9	110.2	76.0	123.4	66.1
5 launderings	137.1	73.8	78.6	50.4	110.0	46.5	104.2	50.9	131.0	76.6	127.9	75.7	126.3	62.9
10 launderings	132.2	78.2	84.3	50.7	100.4	46.9	105.8	49.4	140.0	75.0	133.2	82.6	135.9	64.2
15 launderings	134.4	69.4	80.8	49.9	110.2	40.0	100.9	47.9	135.2	70.8	131.7	77.8	130.0	64.0
20 launderings	125.6	67.1	88.1	50.8	103.4	45.6	102.6	44.7	148.6	72.2	116.7	73.1	133.0	62.8
25 launderings	121.7	61.3	84.4	44.5	83.7	44.7	101.4	43.3	143.7	74.4	115.4	75.1	131.3	57.7
Change in Bursting Strength as a Result of Commercial Laundering (%)														
	Dry	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*	*Dry*	*Wet*
1 laundering	0.0	—12.7	—6.4	—4.7	—0.5	—8.4	+5.0	—0.2	+16.3	—1.8	—1.0	—1.0	—6.7	—2.1
5 launderings	+0.07	—8.3	—11.3	—2.1	—2.0	—10.9	+24.3	—0.4	+16.1	—0.4	+14.9	—1.4	—4.4	—6.8
10 launderings	—3.5	—2.9	—3.8	—1.6	—10.5	—10.2	+26.3	—2.6	+24.1	—1.7	+19.7	+7.6	+2.8	—4.9
15 launderings	—1.2	—13.8	—8.8	—3.1	—1.8	—23.4	+20.4	—5.5	+19.1	—7.2	+18.3	+1.0	—1.7	—5.2
20 launderings	—8.3	—16.6	—0.6	—1.4	—7.8	—12.6	+22.4	—11.8	+31.7	—5.4	+4.9	—4.8	+0.6	—7.0
25 launderings	—11.2	—23.9	—4.8	—13.6	—25.4	—14.4	+21.0	—14.6	+27.4	—2.5	+3.7	—2.2	—0.7	—14.5
Dry Breaking Strength (lbs)														
	Warp	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*
Original fabric	56.6	53.1	60.0	27.8	50.5	41.2	45.8	45.4	50.4	47.0	56.6	51.2	38.7	52.7
After 15 washings	52.8	45.2	50.4	32.5	42.7	36.6	43.2	41.5	48.7	51.5	49.8	47.2	39.9	45.9
25 washings	50.7	42.1	49.7	28.2	39.7	36.3	40.1	40.1	50.3	49.3	48.8	44.8	37.7	48.5
Change in Dry Breaking Strength (%)														
	Warp	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*	*Warp*	*Fill*
After 15 washings	—6.7	—14.9	—16.0	+16.9	—15.4	—11.2	—5.8	—8.6	—3.4	+9.6	—12.0	—7.8	+3.4	—12.9
25 washings	—10.4	—20.7	—17.2	+1.4	—21.4	—11.9	—12.4	—11.7	—0.2	+4.3	—13.8	—12.5	—2.6	—8.0

FINDINGS

COMMERCIAL LAUNDRY TRIALS——Table II presents the strength values for the fabrics given 25 repetitions of the laundry procedure as outlined. Table III gives a comparison of laundering with and without pressing, and with and without exposure to light in a Fade-Ometer.

ACCELERATED CHLORINE TEST——Table IV gives the losses in dry breaking strength of the five experimental fabrics upon which the described tentative accelerated chlorine-retention test is based.

DISCUSSION

Table II shows that changes in dry bursting strength during 25 low-temperature commercial laundry treatments involving small concentrations of chlorine, as described, ranged from a gain of 27.4 per cent to a loss of 25.4 per cent. Shrinkage was excessive in all fabrics which showed a gain in dry bursting strength.

In wet bursting strength, on the other hand, all fabrics lost strength by values ranging up to 23.9 per cent.

In dry, warpwise breaking strength, losses of generally small magnitude occurred after 15 launderings with but few exceptions; these losses were increased somewhat by the end of the twenty-fifth laundering, with the highest loss 21.4 per cent.

In the case of the dry, fillingwise strength values, changes ranged from slight gains to a maximum loss of 20.7 per cent by the close of 25 launderings.

Laundering and Pressing——Hand pressing with an iron carefully controlled at the temperature suggested for rayon (275° F) did not add to the breaking strength losses in the fabrics. In fact, most of the fabrics

TABLE III

STRENGTH VALUES OF EXPERIMENTAL FABRICS WASHED AT LOW TEMPERATURES ACCORDING TO A COMMERCIAL LAUNDRY FORMULA INVOLVING 0.008 PER CENT AVAILABLE CHLORINE IN ONE STEP OF THE PROCEDURE WITH AND WITHOUT PRESSING AND WITH AND WITHOUT LIGHT EXPOSURE IN A FADE-OMETER (LBS)

Treatments	*Fabric 1*		*Fabric 2*		*Fabric 3*		*Fabric 4*		*Fabric 5*		*Fabric 6*		*Fabric 7*	
	Warp	*Filling*	*Warp*	*Filling*	*Warp*	*Filling*	*Warp*	*Filling*	*Warp*	*Filling*	*Warp*	*Filling*	*Warp*	*Filling*
Original fabric	56.6	53.1	60.0	27.8	50.5	41.2	45.8	45.4	50.4	47.0	56.6	51.2	38.7	52.7
After 15 washings, only	52.8	45.2	50.4	32.5	42.7	36.6	43.2	41.5	48.7	51.5	49.8	47.2	39.9	45.9
After 15 washings, and five pressings	55.1	46.2	56.0	31.1	48.3	42.4	45.1	45.5	52.7	53.5	53.4	48.3	41.0	51.6
After 25 washings, only	50.7	42.1	49.7	28.2	39.7	36.3	40.1	40.1	50.3	49.3	48.8	44.8	37.7	48.5
After 25 washings, and 15 pressings	54.2	46.2	51.4	30.0	45.3	38.0	43.4	42.5	54.4	45.6	51.9	45.8	40.3	48.9
After 25 washings, and 80 hours in Fade-Ometer	40.7	28.6	37.8	15.2	25.2	29.0	29.1	15.5	45.3	36.8	47.0	36.8	30.9	46.9
After 80 hours in Fade-Ometer, only	48.6	49.1	56.3	22.2	41.3	37.9	43.7	33.0	50.5	48.1	57.1	44.9	36.7	48.4
Change in Dry Breaking Strength (%)														
After 15 washings, only	—6.7	—14.9	—16.0	+16.9	—15.4	—11.2	—5.8	—8.6	—3.4	+9.6	—12.0	—7.8	+3.4	—12.9
After 15 washings, and five pressings	—2.7	—13.0	—6.7	+11.9	—4.4	+2.9	—1.5	+0.2	+4.6	+14.0	—5.7	—5.7	+5.9	—2.1
After 25 washings, only	—10.4	—20.7	—17.2	+1.4	—21.4	—11.9	—12.4	—11.7	—0.2	+4.3	—13.8	—12.5	—2.6	—8.0
After 25 washings, and 15 pressings	—4.2	—13.0	—14.3	+9.0	—10.3	—7.8	—5.2	—6.4	+7.9	—3.0	—8.3	—10.3	+4.1	—7.6
After 25 washings, and 80 hours in Fade-Ometer	—28.1	—46.1	—37.0	—45.3	—50.1	—29.6	—34.4	—63.6	—10.1	—21.7	—17.0	—28.1	—20.2	—11.0
After 80 hours in Fade-Ometer, only	—14.1	—7.5	—6.2	—20.1	—18.2	—8.0	—4.6	—27.3	+0.2	+2.3	+0.9	—12.3	—5.2	—8.2

showed very slight strength gains in both directions, in those fabrics that were pressed, in comparison with those given an equivalent number of washings without any pressings. See Table III.

Launderings and Light Exposure——The above findings were not entirely compatible with observations on fabrics of similar types in practical use, which had lost much of their strength during wear although they had received but few launderings. Moreover, both the odor of the fabrics as well as qualitative tests for chlorine made on these experimental fabrics showed that chlorine was being retained to progressively greater degrees as the launderings proceeded. Therefore, it was decided to expose the laundered fabrics to light in a Fade-Ometer, under the conditions as described, in order to find whether the damage to textile articles with chlorine-retentive finishes, which the authors had encountered, may have resulted from a combination of laundering and light exposure.

Table III gives the dry-breaking-strength changes of the seven test fabrics after 25 launderings, followed by 80 hours of exposure in the Fade-Ometer, as well as that found after 80 hours of light exposure alone. Throughout, it is seen that the results of laundering followed by light exposure were greater than the sum of the results obtained by the two separate agencies. The losses in the fabrics given both laundry and light treatment ranged from 10.1 to 50.1 per cent in the warp, and from 11.0 to 63.6 per cent in the filling direction.

Accelerated Chlorine Test——Table IV, which gives the losses in dry breaking strength of five of the experimental fabrics to which the accelerated chlorine test was applied, shows that the dry strength losses resulting from this test ranged from 68.6 to 90.8 per cent warpwise, and from 73.4 to 88.4 per cent fillingwise. These losses are consistent with practical observations of the authors, although they are greater than those obtained with 25 repetitions of the low temperature-low chlorine concentration laundry formula, with no time allowed for interim aging, followed by 80 hours in the Fade-Ometer. As this investigation proceeded, a variable factor was found in the lapse of time and the extent of light exposure between the application of chlorine followed by pressing, and the actual making of the breaking strength tests. Moreover, no control fabrics identical with the experimental fabrics except for the type of finish were available in this preliminary study.

These facts prompted further studies in this laboratory on tests for chlorine retention in textile finishes, which still are in progress.

TABLE IV

PERCENTAGE CHANGE IN DRY BREAKING STRENGTH OF FABRICS GIVEN AN ACCELRATED CHLORINE TEST

(0.13 per cent available chlorine at 140°F for 10 minutes, followed by rinsing, drying and heat treatment at 400°F for 30 seconds)

Fabric Number	*PERCENTAGE CHANGE*	
	Warp	*Filling*
(1)	—74.0%	—76.1%
(3)	—68.6	—73.4
(4)	—85.1	—88.4
(5)	—74.4	—79.8
(6)	—90.8	—84.2

SUMMARY

A proposed accelerated chlorine test was applied to experimental melamine-formaldehyde resin-finished rayon fabrics. This was compared with strength losses effectuated by 25 repeated launderings, using a low-temperature commercial washing procedure, with 0.008 per cent of chlorine in the third step of the operation. The strength losses incurred during the commercial laundering trials were low in comparison with those found in the accelerated chlorine test, and likewise in comparison with previous practical observations by the authors.

Pressing at a temperature of 275° F did not increase the strength losses.

Exposure for 80 hours in a Fade-Ometer following the 25 launderings greatly increased the strength losses, but still did not bring them to as high a level as did the accelerated chlorine test under investigation. It was concluded that strength loss during laundering by a procedure involving chlorine was accelerated by the action of light, and that high strength losses observed in fabrics with certain types of resin finishes were the result of aging (particularly in the presence of light) of fabrics which had adsorbed chlorine during laundering.

This study was preliminary in nature, and is being continued.

ACKNOWLEDGEMENT

The authors are indebted to Pauline Beery Mack, Dean of the College of Household Arts and Sciences, Texas State College for Women, and former Director of the Ellen H Richards Institute, School of Chemistry and Physics, The Pennsylvania State College, for help in planning and reporting this study.

• PATENT DIGEST •

PAUL WENGRAF

PERMANENT FINISH—— Maleic Anhydride-Vinyl Resins and Polyalcohols G, 2, 01

USPat 2,609,350
(General Aniline——Spatt——Sept 2, 1952)

Various synthetic resins in the past have been applied to impart a durable finish to textiles. The present specifications points out, however, that the finishing effect of these compositions is either too hard or too brittle, that the fabrics may sometimes be weakened, and so on.

As an alternative, the inventor suggests the use of a combination of

a) a polyalcohol, preferably *polyvinyl-alcohol,* giving a desirable finish to textiles, and

b) a synthetic resin obtained by copolymerization of maleic anhydride with a polymerizable vinyl compound containing only one: C:CH_2 group.

The resins of group b) are acid in character and apt to damage the fibers. It is necessary to raise the pH to 3.2-4.0 by adding a basic agent, preferably ammonia or an amine. By impregnating a fabric with a mixture of a) and b) and subsequently baking, a cross-linking esterification reaction between the two components may be effected to set the finish on the fabric.

Example: an aqueous solution of the copolymerizate of methyl vinyl ether and maleic anhydride is mixed with an aqueous polyvinylalcohol solution, warmed to 85-90° C and adjusted to pH 3.5. Cotton cloth padded in this solution is dried and baked. A washfast finish results.

Among the references cited by the Patent Office:

U S Pat 2,487,223 (Du Pont/1949): for plywood, initially thermoplastic thermosetting adhesives, consisting of formaldehyde, an acidic catalyst and polyvinylbutyral dissolved in an inert solvent.

U S Pat 2,469,408-9 (Monsanto/1949): a textile finish comprising a solution of an

ammonium salt of a styrene-maleic anhydride copolymer combined with an alkylated methylol-melamine or formaldehyde.

U S Pat 2,419,880 (Du Pont): for bonding plywood, an adhesive composition of linear polyvinyl resins (e g, a styrene-maleic anhydride interpolymer) and polyvinyl acetate.

U S Pat 2,418,688 (National Dairy Products/1947: elastic substances from methyl-acrylate——maleic anhydride copolymers reacted with glycol.

PARCHMENTIZED PRINTS—— Pigmented Parts Remaining Soft D, 1

USPat 2,611,678
(Ginzel——Sept 23, 1952)

The well known parchmentized-print style, which consists of preprinting colored pigments, generally has the disadvantage of requiring binders, such as albumen, for fixing the pigments. A stiff printed area resulted regardless of whether hardening proteins or artificial resins are used as fixing agents and many additive reagents (plasticizers, glycerin, paraffin, etc) have been proposed for softening the prints.

The current invention aims at producing a printed parchmentized cellulose fabric in which the pigmented printed portions do not show additional stiffness compared with nonpigmented, transparent ground. This effect is produced through the use of emulsions of "oleaginous" character as pigment binding agents, i e, paraffins, vegetable oils and fats, waxes, higher fatty acids and so on. It has been observed that these emulsions, when dried and passed through the transparentizing bath of sulfuric acid (45-55° Bé), coagulate completely to form a very strong binding agent. Details regarding the nature of the pigments, the use of cation-active agents (benzyl pyridinium sulfate), and the desirable pastes for the charge are disclosed. Preparation of the emulsions is not described in detail, so it may be assumed that the nature of the emulsion is of no special importance.

It is claimed that the single fibers only are covered with the pigmented paste, leaving the interstices between the threads unfilled. The method is somewhat analogous to the pigment-emulsion printing practice known as "Aridye" printing. It is surprising to find that fatty emulsion prints of a similar type can be fixed by parchmentizing.

Example: a bleached cotton muslin is printed with a paste composed of a starch-trag thickener, an aqueous paraffin emulsion, colloidal sodium silicate, titanium—white pigments and a small amount of Indanthrene Blue paste (obviously for giving a bluish tint). The goods are then dried, parchmentized with sulfuric acid, neutralized, mercerized and rinsed until the excess pigment adhering to the fibers surface is removed.

Example No. 4 in the specification pertains to a combination of this effect with a standard vat print (Indanthrene Blue RZ).

Among the references cited by the Patent Office:

USPat 2,298,147 (Du Pont/1942): white resists under vat dyeings. (Indigosols or the usual vat dyebath formulas). These consist of wax emulsions to which aluminum salts are added to give temporary hydrophobic effects.

USPat 2,202,200 (Ciba/1940): pigment resists under transparentized ground, obtained by melamine resins as fixing agents.

USPat 2,171,513 (Heberlein Pat Corp/1939): crepelike, transparent and translucent textiles are produced according to known methods by using "active" (i e, cleaned, reactive) yarns and raw vegetable yarns containing the natural incrustations. The latter are relatively insensitive to swelling agents.

USPat 2,080,509 (Reconstruction Finance Corp/1937): Printed resists under silk which is to be shrunk with hydrochloric acid. The paste consists of an emulsion of waxes and soaps.

PRINTING TEXTILES by PHOTOGRAPHIC METHOD—— Indigosols Catalyzed by Preprinted Prussian Blue D, 2, 04

USPat 2,611,701
(General Aniline & Film Corp——Schoen——Sept 23, 1952)

According to the priority data this patent corresponds to Can Pat 478,723 [cf *Am Dyestuff Reptr 41*, 152, 1952].

VAT DYEING with Cobalt-Phthalocyanines C, 4, 02

USPat 2,613,128
(Farbenfabriken Bayer——Baumann, Bienert——Oct 7, 1952)

Phthalocyanine dyes in general are well known for their brightness and light-fastness properties. The current specification points out, however, that attempts to use them from regular vats hitherto have failed. Brit Pat 322, 169 (see references) refers to sulfonated and nonsulfonated Ni, Cu and Fe phthalocyanines, but neither the sulfonated nor the non sulfonated Cu- and Ni complexes have vatting properties. The Fe-complex compounds can be vatted but give only feeble dyeing results.

The inventors observed that, surprisingly the cobalt-phthalocyanine complexes can be applied according to normal vat dyeing methods, yielding clearer shades than the iron complexes. Moreover, the solutions of the cobalt-phthalocyanines are very stable. Compounds substituted by sulfonic acid groups, sulfonamides, etc, to increase their solubility, are particularly useful for vat dyeing. Even small amounts of the substituted products can convert a relatively great amount of nonsubstituted cobalt-phthalocyanines (60-85% of the whole composition) into perfectly vattable products.

According to one of the examples, a cobalt-phthalocyanine paste of this type is mixed with caustic soda and hydrosulfite and reacted for about 15 minutes at 50° C. Cotton is dyed as usual with this preparation in the presence of anhydrous sodium sulfate for one hour. After being squeezed and reoxidized in the air, the fabric is soaped at the boil.

The shades obtained depend on the specific composition of the cobalt-phthalocyanine complex compound. The examples describe different cobalt-phthalocyanines prepared from soluble cobalt salts and phthalic anhydide, phthalimide and other phthalic acid derivatives; blue to greenish-blue shades are said to result.

References cited by the Patent Office:

USPat 2,133,340 (General Aniline-Bienert/1938): phthalocyanines containing acylamino groups in the dyestuff forming benzene nuclei to give off a more greenish shade in contrast to the blue phthalocyanine dyes.

Brit P 322,169 (Scottish Dyes Ltd/1929): preparing phthalocyanines from phthalamide and a metal salt; optionally transforming them into soluble products by sulfonation. (Cobalt is not mentioned among the metal salts).

VAT DYEING with Cobalt-Phthalocyanines—— Phosphonous Acid Compounds C, 4, 02

USPat 2,613,129
(Du Pont——McCormack, Stilmar——Oct 7, 1952)

Reports in P B 70,339 (frame 1120 b/1948), quoted in the preamble to the present specification, cover exactly the same process as outlined above (US Pat 2,613,128). This specification contends, however, that the solubility of the aforementioned products in normal vats is still insufficient. It has been observed that the effect can be greatly improved by introducing into the molecule the phosphonous acid group—$P:(OH)_2$ by first reacting with phosphorus trichloride and subsequently hydrolyzing to substitute chlorine by —OH.

The examples report deeper results, by far superior to those obtained heretofore by dyeing phthalocyanines from vats.

Proceedings of the
American Association of Textile Chemists and Colorists

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Editor of Proceedings: **Carl Z Draves, 30 Lahey St, New Hyde Park, N Y**

April 27, 1953

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This column is open for two insertions per year, per member, without charge. Blanks can be obtained from. and filed with, the Secretary of the Association, Lowell Textile Institute. Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

53-6

Education: high school and 9 years of evening textile school.

Experience: dyer and finisher, wool and cotton, with executive experience and other plant contacts.

Age: 47; single; references; Mid-west or South preferred, but not essential.

4-13, 4-27

53-7

Education: B S in Chemistry.

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4-13, 4-27

53-8

Education: BTC, Lowell Textile Institute.

Experience: textile chemist, research and executive.

Age: 40; single; references; Eastern Massachusetts preferred.

4-13, 4-27

—♦ ♦—

Noted Cosmetic Chemist to Speak at WNE Ladies Night

DONALD H POWERS, Director of Research for Warner-Hudnut Company, New York, N Y, has been scheduled for a return speaking engagement at the Western New England Section's Ladies Night meeting on May 8 in the Saratoga Room of the Waverly Inn, Cheshire, Conn. His subject will be "The Chemistry of Modern Cosmetics".

The response to Dr Powers' talk, "What Makes Milady Beautiful?", given before the Ladies Night group two years ago, has prompted Program Chairman John Hirn to solicit his services once again for the annual affair.

In addition to Dr Powers' presentation, a colored sound movie, "Tournament of Roses", will be shown, courtesy of the Travel Bureau of the Hartford Times.

Guests are cordially invited.

Reservations may be obtained from S V Vaniotis, Ciba Co, Inc, 627 Greenwich St, New York 14, N Y.

CALENDAR

AATCC

COUNCIL
June 5.

NATIONAL CONVENTIONS
September 17-19, 1953 (Hotel Conrad Hilton, Chicago); Sept 15-18, 1954 (Atlanta Biltmore, Atlanta, Ga); Sept 21-23, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J).

HUDSON-MOHAWK SECTION
May 8 (Albany); June 19 (Outing).

MID-WEST SECTION
June 13 (Outing, Lake Delavan, Wis); November 7 (Hotel Bismarck).

NEW YORK SECTION
May 22 (Kohler's Swiss Chalet, Rochelle Park, N J); June 19 (Outing, North Jersey CC, Wayne, N J); Sept 25, Oct 3, Nov 20 (Swiss Chalet); Jan 29, Feb 26 (Hotel Statler, N Y); April 23, 1954, May 21, 1954 (Swiss Chalet).

NORTHERN NEW ENGLAND SECTION
May 15 (Andover CC, Andover); June 12 (Annual Outing); Nov 6 (LTI); Dec 4 (MIT Faculty House).

PHILADELPHIA SECTION
May 22 (Outing, Manufacturer's Golf & Country Club); Sept 11; Oct 23; Dec 4; Jan 15, 1954.

PIEDMONT SECTION
June 12-13 (Mayview Manor, Blowing Rock, N C); Sept 12 (Hotel Charlotte, Charlotte, N C).

RHODE ISLAND SECTION
May 22 (Prov Eng Soc); June 12 (Outing, Wannamoisett C C); Oct. 23 (Prov Eng Soc); Dec 4 (Annual Meeting, Sheraton-Biltmore, Providence).

SOUTHEASTERN SECTION
June 19-20 (Outing, Radium Springs).

SOUTH CENTRAL SECTION
May 23 (Patten Hotel, Chattanooga, Tenn); Aug 21-22 (Outing, Chattanooga Golf & Country Club, Chattanooga, Tenn); Dec 5 (Patten Hotel).

WESTERN NEW ENGLAND SECTION
May 8 (Ladies Night, Waverly Inn, Chesire, Conn); June 19 (Outing, Wallingford Country Club); Oct 2, Nov 6 and Dec 11 (Rapp's).

In response to many requests AATCC has made reprints of Part III of the *1952 Technical Manual and Year Book*, which contains the official Association test methods. The reprints are suitably bound for use in the laboratory. Copies are available from the Secretary, H C Chapin, Lowell Textile Institute, Lowell, Massachusetts, at a cost of $1.00.

COMING EVENTS

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
6th Northern Textile Conference, May 1 (Sheraton-Plaza, Boston, Mass).

AMERICAN OIL CHEMISTS' SOCIETY
44th Annual Meeting, May 4-6, Roosevelt Hotel, New Orleans, La; 27th Fall Meeting, November 2-4, Sherman Hotel, Chicago, Ill.

AMERICAN SOCIETY FOR QUALITY CONTROL
Textile Division: May 27-29, Convention Hall, Philadelphia, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS
1953 Annual Meeting, June 29-July 3, Chalfonte-Haddon Hall, Atlantic City, N J; 1953 Fall Meeting, Oct 14-16, New York, N Y.

AMERICAN TEXTILE MACHINERY ASSOCIATION
Exhibit of American Textile Machinery, April 26-May 1, 1954, Atlantic City Exhibition Hall, Atlantic City, N J.

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC
Annual Meeting—25th Anniversary-October 27 (Hotel Belmont Plaza, New York).

CANADIAN ASSOCIATION OF TEXTILE COLOURISTS AND CHEMISTS (Quebec Section)
June 20 (Annual Golf Tournament).

GARMENT DYERS GUILD OF AMERICA
1953 Technical Clinic, November, Seneca Plant, Rochester, N Y.

GORDON RESEARCH CONFERENCES
June 16-Sept 4 (Colby Jr College, New London, N H).

INTERNATIONAL FEDERATION OF TEXTILE CHEMISTS AND COLORISTS ASSOCIATIONS
1953 Congress: September 17-19, Luzern, Switzerland (under the auspices of the Swiss Association of Chemists-Colorists).

LOWELL TEXTILE INSTITUTE ALUMNI ASSOCIATION
All-Alumni Reunion, May 22 (Boston) and May 23 (Lowell).

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS
41st Knitting Arts Exhibition, April 27-May 1, Atlantic City Auditorium, Atlantic City, N J.

NEW BEDFORD TEXTILE INSTITUTE ALUMNI ASSOCIATION
Annual Homecoming & Clambake, June 6, New Bedford, Mass.

NEW YORK BOARD OF TRADE (DCAT)
Drug, Chemical and Allied Trades Section; 63rd Annual Meeting, Sept 24-27, Pocono Manor Inn, Pocono Manor, Pa.

PHI PSI FRATERNITY
50th Convention, May 7-9, Penn-Sheraton Hotel, Philadelphia, Pa.

PURDUE INDUSTRIAL WASTE CONFERENCE
8th Conference, May 4-6, Purdue University Memorial Union Building, Lafayette, Ind.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
June 11-13 (Joint Outing with Manufacturing Chemists' Association at The Greenbrier, White Sulfur Springs, W Va.

TEXTILE RESEARCH INSTITUTE
1953 Annual Meeting, Nov 12-13.

TEXTILE WORKSHOP
3rd Annual Meeting: June 10-July 1, Lowell, Mass.

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STUDENT

H G Dowis — Georgia Institute of Technology. Sponsor: C A Jones.

CORPORATE

Duofold, Inc

APPLICATIONS FOR TRANSFER TO SENIOR MEMBERSHIP

Ernest A Freeman, Jr
John C Picken — *Horace R Hilton*
Winnifred A Wardell — *Robert A Moren*

Hudson-Mohawk Section Meeting Report

March 20, 1953
Jack's Restaurant, Albany, N Y

THE Hudson-Mohawk Section held its March 20th dinner and technical meeting at Jack's Restaurant, Albany, N Y, at which time Gordon O Smith, Technical Service Department, Mathieson Chemical Corp, presented a paper entitled "Oxidizing of Textone". The presentation covered some of the latest developments in the bleaching of synthetic fibers with Textone.

Fifty-one members were in attendance.

Respectfully submitted,
WILLIAM A NELSON, *Secretary*

R I Section Meeting Report

March 27, 1953
Providence Engineering Society
Providence, R I

AT THE March 27th Meeting of the Rhode Island Section at the Providence Engineering Society, Providence, R I, Harry F Clapham of E I Du Pont de Nemours & Co, Inc, gave a paper entitled "The New Neutral Dyeing Colors for Wool", and Harvey Sarles of G H Walker Co discussed "The Rhode Island Development Corporation".

Approximately seventy-five members attended the meeting at the Engineering Society, and fifty members enjoyed a pre-meeting social hour and dinner at the Sheraton-Biltmore Hotel.

Respectfully submitted,
R G THOMAS, *Secretary*

Buttons bearing the insignia of the AATCC are now available from the Secretary at a new price of $2.25. Pins, with safety clasp, are also available at $2.50 each. Write directly to H C Chapin, AATCC Secretary, Lowell Textile Institute, Lowell, Mass.

1953 NATIONAL CONVENTION
CHICAGO, ILLINOIS • SEPTEMBER 17, 18, 19
Headquarters: Conrad Hilton Hotel
Auspices of Mid-West Section

1952 Intersectional Contest——

THE EFFECT OF CONDITIONING ON CREASE-RECOVERY ANGLE*

PIEDMONT SECTION

INTRODUCTION

IT is common practice in the textile industry to apply thermosetting resins in fabric finishing. These resins are applied to rayon constructions and to blends of rayon and acetate (and other new synthetic fibers). They are also applied to cotton dress fabrics in a large way and, to a lesser extent, to woolen fabrics.

There are a number of reasons for applying thermosetting resins, but this paper concerns itself primarily with the effect of a resin in improving the recovery of a fabric from creasing. In the past the measurement of this property has been done by the TBL method, but in this study it was done by the newer Monsanto method. The values are loosely reported as the *crease-recovery angle,* since this is the jargon of the trade and since the exact phrasing is rather complicated.

The history of this particular study will be of interest to all groups working on intersectional-contest papers, as it is a by-product of an earlier work of the Piedmont Section. A paper had been in preparation over a two-year period comparing the effects of different catalysts upon urea-formaldehyde resins. A considerable amount of work had been done with various catalysts in an effort to outline a desirable procedure for the evaluation of old and new materials. In an effort to measure the effect of catalysts from the properties of a resin-treated fabric, the following determinations were made:

1) The degree of fixation of the resin
2) The effect on tear and tensile strength
3) Measurements of crease-recovery angle
4) Abrasion tests
5) Odor tests

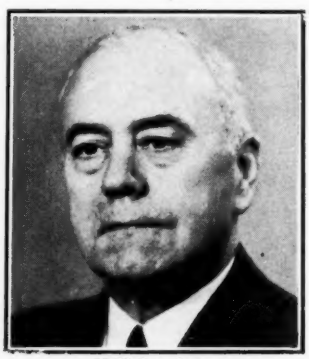
In addition, the catalysts were evaluated as to their effect upon resin-bath stability.

A considerable amount of correlation work was done by the various laboratories in the section, and, in the case of measuring the resin content of treated fabrics, the agreement was very satisfactory. On the other hand, the results of the measurement of other properties showed rather wide variations, making it difficult to interpret the data.

* Presented at the Statler Hotel in Boston on Nov 8, 1952, by Francis K Burr for the Piedmont Section.

COMMITTEE

H Y Jenning, *Chairman*
Henry A Rutherford
Francis K Burr, *Speaker*
Joseph C King
Linton C Reynolds
R Hobart Souther
Russell G Lawrence



H Y Jennings

In the course of a study by the Piedmont Section on resin finishes it was discovered that conditioning affects crease resistance and the measurement of crease-recovery angles. The Section then made a quantitative investigation of the phenomenon for this paper.

One observation that seemed odd was the fact that an all-rayon resin-treated fabric exhibited no improvement in crease-recovery angle over the untreated fabric. Indeed, it was occasionally noted that the untreated was superior when measured according to standard techniques. It was this discovery plus the desire to probe further that led to the abandonment of the earlier paper. Thus the path of research often moves on a tangent.

It has been known (although not widely) that resin-treated fabrics require considerably more than a few hours of conditioning before reaching their optimum performance levels. It is perhaps less widely known that untreated fabrics, when allowed to condition for extreme periods of time (for example, several months) sometime show performance characteristics similar to resin-treated ones. Much of the information along these lines has been merely unconfirmed opinions or the results of superficial studies. It had therefore become the desire of the Piedmont Research Committee to attempt to describe these phenomena somewhat quantitatively.

EXPERIMENTAL

The fabric chosen for study was an all-rayon shirting. It had been desized and scoured before its use in the previously mentioned study on catalysts. Thus it had aged for at least a year. When samples of this control are placed in a conditioning room for 24 hours, a crease-recovery angle of approximately 120° in the warpwise direction is noted. This same fabric, when treated with urea-formaldehyde resin to leave 10-20% of solids on it and conditioned for 24 hours, also yields a crease-recovery angle of approximately 120°. The logical question arises, "Why treat with resin and achieve no enhancement of fabric?" We will rationalize that question as we proceed.

First of all, we recognize that improved *crease resistance* is not the only boon of resin treatment. However, it is probably as important as stabilization, if not more so. At least, it was this property that launched the whole development. Why then did our treatment *fail* in its objective?

We prepared (from the above-mentioned rayon fabric) what will be referred to in this paper as a *water blank.* This sample was subjected to all the operations of resin treatment except that water alone was used in the padding operation. The crease angle after 24 hours conditioning was now 90° or lower.

This startling loss of a performance characteristic is certainly a surprise, yet it was felt that, if this fabric before treatment had a crease-recovery angle of about 120°, it might return to this higher value in time. Thus, it is recorded in Fig 1 that, after 60 days of conditioning, the water blank again approached 120°.

Fig 1 also shows the behavior of the control and the resin-treated samples over this same 60-day period. The control, which had aged so long before the start of the tests, stayed pretty close to the 120° line. The resin-treated samples, while initially somewhat lower than the control, soon equalled it and eventually exceeded it as the values approached 140°.

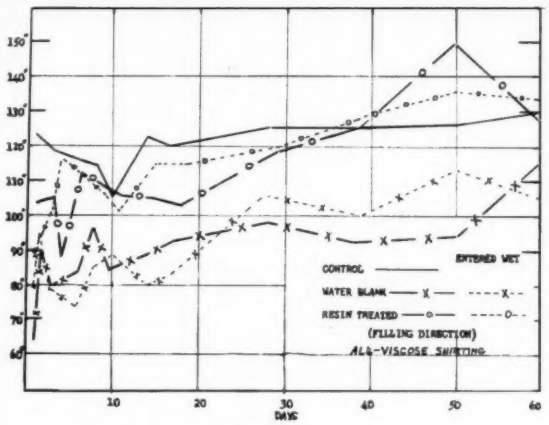


Figure 1
Crease-Recovery Angles vs Conditioning Time

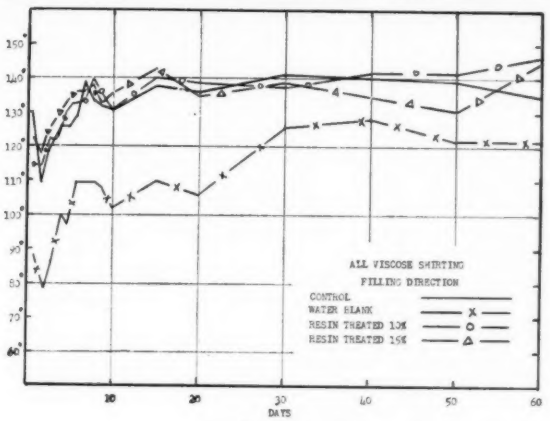


Figure 2
Crease-Recovery Angles vs Conditioning Time

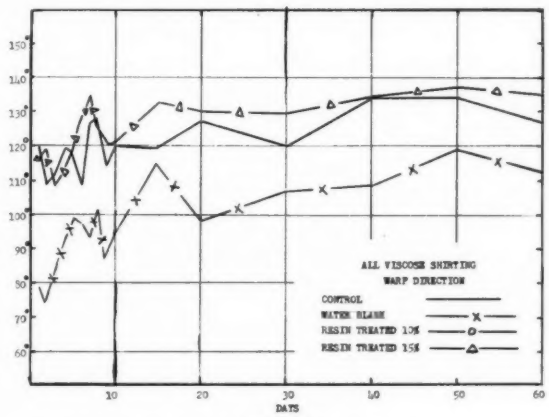


Figure 3
Crease-Recovery Angles vs Conditioning Time

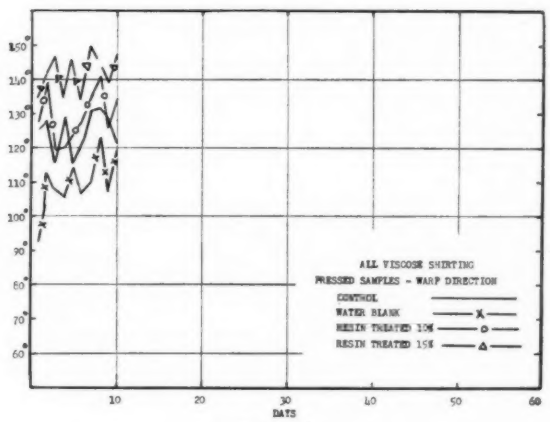


Figure 4
Crease-Recovery Angle vs Conditioning Time

The dotted curves indicate samples of resin-treated fabric and the water blank placed in the conditioning room in a wet condition. The results (with the exception of the first day or so) were not significantly different from the samples entered dry. The wet resin-treated sample was initially much lower, while the wet water blank started off somewhat higher than its dry counterpart. There seemed to be nothing fruitful in pursuing this particular avenue, so further work on this aspect was tabled.

In order to convince ourselves that the data in Fig 1 were not necessarily "flukes," we treated additional fabric at two levels of resin content. These samples were placed in the conditioning room of another laboratory and were observed as previously over a 60-day period. Figures 2 and 3 show the results in the filling and warp directions respectively. The curve for 10% resin content is omitted from Fig 3 since it is intermediate between the control and the curve for 15% resin content.

The reader may be unfavorably impressed by the fact that the resin-treated samples showed so little advantage over the control. But he must not lose sight of the already good performance of the control. What is pertinent is the behavior of the water blank, the crease-recovery angle of which went to pot the minute it got wet and which recovered its ability to resist mussing only after several months.

Since the irregularity of the curves was of concern to our group, we wondered if pressing the samples would make them smoother. Figures 4 and 5 show the results. If they look like "unfinished symphonies" the reason is purely accidental. The work had been completed through the 60-day period, but the data were lost to posterity. However, it is clear from the data in hand that pressing did not make the road less rocky. Several other factors are of interest. It will be noted that all values, with the exception of the control, were higher initially, and that generally higher values accrued to the resin-treated samples, and very quickly. The water blank also recovered more rapidly. Pressing also seemed to show a greater spread between the different levels of resin content. This finding is not new since it has been recognized that decating enhances the effect of resin treatment.

Another of our sections' laboratories made parallel studies on other all-rayon fabrics to test the universality of these phenomena. Figures 6 and 7 show the same general pattern, although the water blanks for these constructions seemed to recover somewhat faster. No values for an aged control were available in this study.

To go one step further, samples of 80x80 cotton were treated with three different resins and compared with a water blank. Fig 8 illustrates the results. These curves are not intended to compare the efficiency of various resins, as they are not treated at equivalent concentrations. It is probable that the melamine-treated samples were

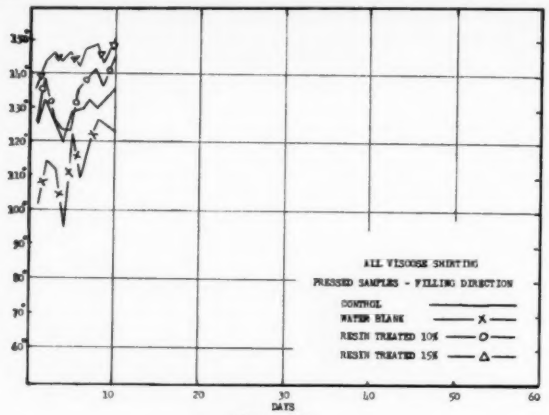


Figure 5
Crease-Recovery Angle vs Conditioning Time

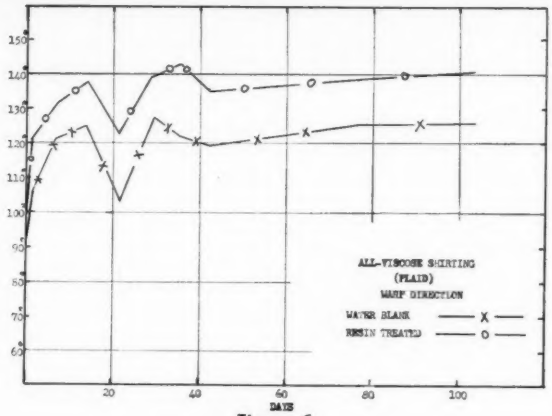


Figure 6
Crease-Recovery Angle vs Conditioning Time

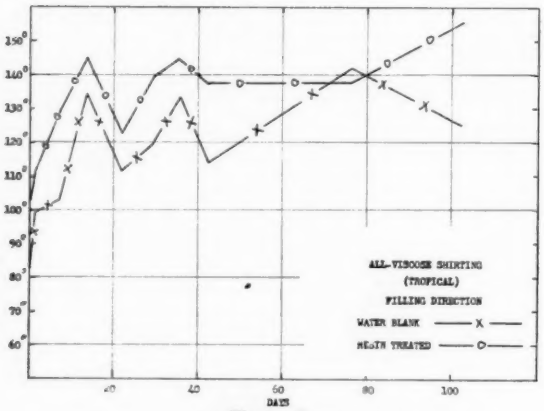


Figure 7
Crease-Recovery Angle vs Conditioning Time

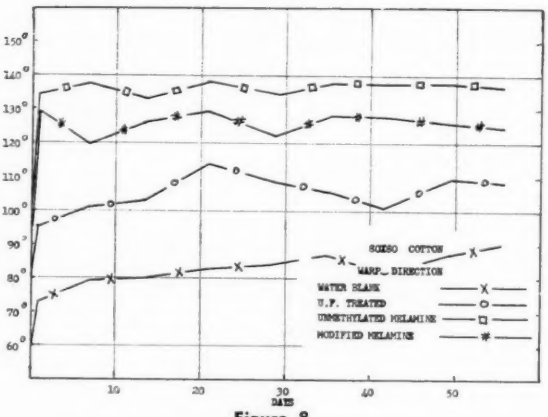


Figure 8
Crease-Recovery Angle vs Conditioning Time

both too heavily treated to be commercially acceptable fabrics. Very low tear strength was indicated. We do have here the zero-day results (the kind the shipping and sales departments want) and they were certainly low compared with those of 24 hours' conditioning. The urea-formaldehyde curve showed slower development than the melamine-type curves, and somewhat smoother curves are noted throughout. This water blank followed a very slow recovery. Probably four or five months will be required to realize values above 100°.

Returning to the all-rayon shirting of Figures 1 to 5, we conducted an experiment to determine the effect of 16 days' conditioning over a desiccant in one case, and over water in another. Table I shows the effect upon the resin-treated fabric as well as the water blank.

These results are not unexpected, especially those samples conditioned over water, as all cellulosic fabrics and most others fail to perform well at 100% humidity. The dried samples, however, exhibited rather high values, considerably higher than their counterparts in Fig 1. The impracticality of the method of testing and its aloofness from terrestial conditions made these data of only academic interest.

Table II in brief form indicates that rayon-acetate blends behave much like all-rayons when the control has been aged before treatment. We present only the crease-recovery angles after the usual 24 hours of conditioning, but are confident that the whole behavior pattern is similar.

It is of particular interest to note that the water blank lost tear strength as well as crease resistance. It is this table which, along with other evidence, leads us to believe that fabric samples are not generally conditioned long enough before property measurement.

But the most striking aspect of the data of Table II is the crease-recovery angles obtained after 3 dry cleanings. It will be noted that the water blank reapproached the control, while the control remained about the same. At the same time the resin-treated sample showed a considerable gain in crease-recovery angle.

The results after three dry cleanings were obtained by subjecting samples to the equivalent of three successive cleansings (without intermediate dryings) followed by drying and pressing. Thus, these operations could be done on one day and the conditioned samples measured for crease-recovery angles the next day.

Tables III and IV further explored this angle with respect to the all-rayon shirting of the earlier experiments. A comparison was drawn between the initial (24-hour)

TABLE I
EFFECT OF HIGH AND LOW HUMIDITY ON CREASE-RECOVERY ANGLE

	Crease-Recovery Angle Degrees, 16 Days
Over Desiccant	
Rayon Shirting, 10% U-F	135
Rayon Shirting, Water Blank	109
Over Water	
Rayon Shirting, 10% U-F	71
Rayon Shirting, Water Blank	66

TABLE II
CREASE RECOVERY ANGLES FOR 50/50 ACETATE-RAYON SUITING

	Tear Strength Lb		Crease-R A° Initial		Crease-R A° After 3 D C	
	Warp	Fill	Warp	Fill	Warp	Fill
Control	12.0	10.0	124	122	120	115
Water Blank	11.0	8.0	95	99	117	119
Resin-Treated, 10%	4.8	4.0	119	124	138	140

TABLE III
COMPARISON OF CREASE-RECOVERY ANGLES FOR RAYON SHIRTING UNDER VARIABLE CONDITIONING
UNPRESSED SAMPLES

Sample	Direction	CRA* After 24 Hr Conditioning	CRA After 3 DC**	Av CRA's After 5 Days
RESIN TREATED 15%	Filling	115	130	137
RESIN TREATED 10%	Filling	122	124	135
RESIN TREATED 15%	Warp	117	123	128
RESIN TREATED 10%	Warp	118	125	125
Control	Warp	120	110	123
Control	Filling	130	122	133
Water Blank	Warp	78	102	103
Water Blank	Filling	88	95	113

* CRA—crease-recovery angle, degrees
** 3 DC—3 dry cleanings

TABLE IV
COMPARISON OF CREASE-RECOVERY ANGLES FOR RAYON SHIRTING UNDER VARIABLE CONDITIONING
PRESSED SAMPLES

Sample	Direction	CRA* After 24 Hr Conditioning	CRA After 3 DC**	Av CRA's After 5 Days
RESIN TREATED 15%	Filling	135	150	148
RESIN TREATED 10%	Filling	124	137	137
RESIN TREATED 15%	Warp	135	143	143
RESIN TREATED 10%	Warp	126	140	132
Water Blank	Warp	93	127	114
Water Blank	Filling	102	127	121
Control	Warp	125	134	125
Control	Filling	124	139	132

* CRA—crease-recovery angle, degrees
** 3 DC—3 dry cleanings

reading, the results after 3 dry cleanings (and 24-hour conditioning), and the average of all results after 5 days of conditioning.

After studying the data from Tables III and IV one is struck by the fact that the crease-recovery angles measured after three dry cleanings seem to indicate the ultimate performance of a given fabric. This study is too superficial to warrant concrete recommendations for future adoption, but should be of interest in any later studies to improve methods of reporting crease-recovery angles.

DISCUSSION

Thus far we have reported findings without an effort to explain why some treated (and untreated) fabrics show improved crease-recovery angles after extended conditioning. It has been observed that untreated fabrics benefit more from this prolonged aging than do resin-treated ones. This would surely support the theory that resin treatment shortens the period of conditioning necessary to high performance as far as crease resistance is concerned. Thus, a resin-treated garment is ready for use within a day or so after a cleansing operation, whereas one made from an untreated fabric would have to condition for many weeks.

It is probable that, in the process of conditioning, a fabric must rid itself of strains to achieve maximum performance. It is also probable that resin-treated cellulosic fabrics have fewer or less intense strains to recover from after becoming wet because of the decreased swelling properties resulting from resin treatment. A shorter period is therefore required to relax the strains imposed by wet treatment.

We have implied that the aged control would have yielded high performance as a crease resistance fabric since a reasonably high crease-recovery angle had been measured. That implication had been fortified by considerations of hand. Several observers who handled the fabric thought it had already been resin-treated because of its liveliness, although any weight from added resin was missing. An analysis was made to confirm the fact that no resin was present.

Thus, as long as such a fabric remained reasonably dry it would be expected to perform well. It is believed, however, that subjection to high humidity (body humidity, for example) would quickly lower its efficiency more than that of the resin-treated counterpart.

One inescapable problem which this paper poses is the question of how long samples should be conditioned before being tested. It has been noted that results vary considerably from day to day. Such behavior imposes a burden on the quality-control analyst, since it is impractical to wait several days or weeks to determine a result that a sales department wants immediately. The above-mentioned procedure involving three rapid, consecutive dry cleanings may be a step in the right direction, but further work is needed to improve this situation.

Earlier in the paper we expressed concern over the irregularity of the curves. Although some of this was due to conditioning-room variations and to an occasional change of operators, we could not ascribe the majority of the fluctuations to controllable conditions. Our fabric was a no-face type, so that samples for the tests were cut at random, so to speak. It was suggested that a more representative value would result from measuring recovery angles from two samples folded face to face and two folded back to back. This was tried, and only slight differences were noted for the fabric under study. This speaks well for the resin treatment procedure used, as, in retrospect, it appears that nonuniform drying conditions could produce one-sidedness. We heartily recommend this procedure for sampling, and it is a must for faced fabrics.

Many others probably agree that the test for crease resistance needs further refinement.

SUMMARY

From the above data we summarize the following observations and suggestions:

1) Untreated rayons upon long conditioning yield crease recovery angles in the range of resin-treated rayons.
2) Resin-treated rayons exhibit a much more rapid recovery of crease-resistant properties, but a 24-hour reading is usually greatly exceeded by extended conditioning.
3) A water blank should be prepared in any comparison of treated and untreated rayons.
4) Since the 24-hour result is not characteristic of the ultimate and optimum performance of a resin-treated fabric, some way should be sought to achieve a better measure in a shorter period.
5) The subjection of a resin-treated rayon to three rapid and consecutive dry cleanings before the 24-hour conditioning seems to be a feasible answer to the problem expressed in paragraph 4.
6) Perhaps other physical tests than measurement of crease resistance should be viewed critically with special reference to the effect of thorough conditioning.

Southeastern Section——

THE DU PONT VAT-PRINT DEVELOPMENT PROCESS*

A K SAVILLE

Technical Laboratory, E I du Pont de Nemours & Co, Inc

A patented process is described for printing and developing vat dyes, which makes use of a steamer constructed so the fabric is supported solely on the back in tandem with a conventional oxidizing and soaping range where the pad is replaced by an over-all engraved roller. A vat print containing no reducing agent is stored until convenient and then is fully developed and fixed continuously by overprinting with a thickened solution of caustic soda and hydrosulfite by steaming, rinsing and soaping. The advantages claimed for the process include better color yield, greater brightness, better fastness, savings in chemical and thickening costs, greater stability of undeveloped prints, and an increase in the range of vat dyes applicable by printing.

INTRODUCTION

THE textile finishing industry is witnessing an unparalleled change in consumer requirements initiated by the advances made in the general field of textile chemistry in the past ten years. Introduction and acceptance of nylon and the newer synthetic fibers have markedly affected the dress-goods industry, while the development of many new resins has put light cottons in active competition with synthetics by enabling permanent and unique finishes to be produced. The consumer, by the popularization of the automatic washer, has been enabled to exploit the "easy-to-care-for" properties of these fabrics and is increasingly demanding unconditionally washable and light-fast printed fabrics. In the drapery field, prints of better light and crock fastness are required. To fulfill the conditions imposed by resin finishes and by the consumer, the printing industry is being forced to change its procedures and processes to meet the new, higher standards. The only class of dyes that will meet these standards and be adaptable to resin finishes, unconditionally washable, available in a full range of attractive shades, and suitable for printing is the vat dyes.

VAT DYES AND PRINTING——Vat dyes are insoluble organic compounds which, when acted upon by suitable reducing agents in the presence of alkalis, are converted to soluble derivatives with exceptional affinity for cellulose. Subsequent to adsorption by the cellulose, the original insoluble compound is regenerated by simple oxidation. From the extensive range of reducing agents available, it is surprising that only two closely related compounds have been found to meet the critical requirements for proper vat-dye reduction. These are sodium hydrosulfite and sodium formaldehydesulfoxylate. It was the invention and marketing of this latter product in 1904 which marked the birth of the vat-dye printing industry. Previous to this time the only vat-type dye commercially employed had been indigo, which, when printed from a paste containing caustic soda and glucose, gave attractive blue shades with good fastness properties. However, this combination of reducing agents was found not suitable for the printing of the indigo derivatives which were being developed following the synthesis of indigo in 1897. It was the invention of sodium formaldehydesulfoxylate that provided a reducing agent relatively stable in neutral and alkaline solutions and which would convert vat dyes to soluble leuco compounds. Now the printer could formulate pastes using the new reducing agent and vat dye, print and dry the fabric, and, by aging in a saturated steam atmosphere, reduce and fix dyes on the fiber. Cellulosic fabrics have been printed in the same general manner since.

DISADVANTAGES OF FORMALDEHYDESULFOXYLATE FOR REDUCING VAT PRINTS——Sodium formaldehydesulfoxylate is not an ideal reducing agent. The compound tends to react in the printing paste, and this leads to some premature reduction of dye; after printing, the reducing agent present in a thin film on the printed areas of the fabric may be rapidly lost, particularly under conditions of high temperature and humidity to give uneven and incomplete fixation in aging. Condensation of moisture on the fabric, hydration of chemicals in the print, decomposition of the reducing agent, and the reduction of the dye to its leuco form are reactions that generate considerable heat and cause the temperature in the ager to rise progressively. This is partly compensated for by injecting a great excess of steam to cool the equipment, but in practice it is difficult to keep the aging temperature below 218°F. At these high temperatures many vat dyes are overreduced or otherwise adversely affected, and the print is often shaded along or across the piece. Other dyes react with the decomposition products of the reducing agents and form compounds with little or no affinity for cellulose. These considerations prevent the printer from using many tinctorially strong, economical dyes with exceptional fastness properties which are in general use in the piece-dyeing field. In fact, from an available list of approximately 70 distinct vat types, less than twenty are extensively and successfully used in the printing industry. Even with these selected colors the potential color value is not realized, only 75% to 95% of the total dye being fixed on the fiber even under ideal laboratory conditions.

It is not surprising, therefore, that numerous attempts have been made through the years to modify this process.

To be attractive, such process modification must fulfill these conditions:

1) All vat dyes should be suitable for use in the process to extend the range of shades and properties available to the printer.

2) The potential color value of the dyestuff should be realized.

3) the print paste should be stable before printing and the prints should be indefinitely stable after printing but before aging.

4) The method should be applicable to mass production methods.

5) the technique should require a minimum of special equipment and chemicals for its operation.

6) The cost of printing vat dyes should be considerably reduced.

Many attempts have been made to achieve these objectives, but no method has proved completely acceptable to the American printing industry.

For the past 25 years European and British textile printing plants have printed fabrics with vat-dye pigments from neutral, chemical-free thickeners, and have dried, and later padded these fabrics on a conventional dye padder with thickened mixtures of alkali and reducing agents. This process, used on a limited scale, is subject to variation. Some plants use a mixture of sodium formaldehydesulfoxylate and potash, while others employ sodium hydrosul-

* Presented in the Biltmore Hotel in Atlanta, Ga, on Sept 13, 1952.

fite and caustic soda. With the former reducing system, long steaming times are employed, sometimes up to 20 minutes in a large continuous steamer; with sodium hydrosulfite and caustic soda, 30-40 seconds in air-free steam atmosphere is sufficient. The prints are then conventionally oxidized and soaped. While this procedure eliminates many difficulties associated with conventional printing, other problems are introduced. Dye bleeds from the printed fabric to the padding liquor, is redeposited over the surface of the fabric and tints the white areas of the design. The squeezing action of the padder bowls in expressing excess pad liquor accentuates this bleed, and, by forcing the liquor back over the fabric surface, causes flushing of the printed design. Dye is transferred from the print to the padder, and this color build-up later stains the white and colored areas of the print. To reduce this tendency towards staining and flushing, methyl cellulose was introduced as a thickener in 1928. This was supplemented by locust bean or carob bean gum soon thereafter. These thickeners, usually mixed with starch, gum tragacanth, or sodium alginate, have the unique property of being precipitated by neutral salts, alkali or heat. When a vat dye is incorporated in a printing paste containing these thickeners, printed, and impregnated with reducing agent and alkali, the gum coagulates and encloses the dye particles in an insoluble envelope, which reduces bleed in the pad bath, mark-off on the padder, or flushing of the printed pattern during steaming. Since the dye is surrounded by an insoluble thickener, it is understandable that transfer of the leuco form from the thickener to the fiber will be slow, and, in fact, under practical times of steaming the color value obtained is poor, being at best only slightly superior to similar prints made by conventional methods.

To eliminate mark-off in the padder and obtain reasonable color value, compromises in operating conditions must be made. An increase in the quantity of coagulating gum reduces mark-off, bleed, and color value. A greater pressure on the nips is then possible, giving better expression of pad liquor. Conversely, a lower proportion of coagulating gum leads to increased mark-off, bleed, and color value while limiting the pressure that can be employed on the padder. This lowered pressure gives increased pickup of liquor. If, however, the moisture retention of the fabric after padding is high, the additional moisture from condensation in a steamer operating at 214-216°F is sufficient to cause flushing or running of the print. To reduce this moisture condensation in aging, it is usual to raise the temperature of the steamer to a range of 230-250°F. Moisture condensation is eliminated under these conditions, and flushing during steaming is prevented. This high temperature is not the ideal condition for reduction and fixation of vat dyes on cellulose, and the color yield and brightness of prints aged at this high temperature are inferior to those aged at a lower temperature.

Notwithstanding the large number of variables that must be held constant or controlled if quality results are to be obtained, a few screen printers have obtained excellent results using this process. This technique is not suited, however, to the machine printing industry where production and processing speeds are higher and where labor cost is of greater significance. The requirements of specific thickeners, constant and close supervision during a run, and the necessity of changing these conditions depending on the particular fabric and pattern being run are qualifications hard for the machine printers to accept.

APPLICATION OF THE DU-PONT PAD-STEAM PROCESS TO THE DEVELOPMENT OF VAT PRINTS

The Du Pont Pad-Steam dyeing process indicates that the development of dried vat-dye pigment-padded fabrics by a subsequent chemical padding with caustic soda and sodium hydrosulfite is a chemically sound process. To apply a similar technique to vat-dye pigment prints, which are in effect vat-pigment paddings in discrete and separate areas of the fabric, should be possible under proper mechanical conditions. If the same processing conditions could be produced in the development of prints that exist in the development of pigment-padded dyeings, the color yield, brightness and fastness of the print should equal that of the dyeing. Accordingly, some years ago an exhaustive investigation of the factors influencing print development was initiated. Numerous gums and thickening agents were evaluated under many systems and techniques for applying the alkali and reducing agent and with various kinds and conditions of steaming. From this work the most suitable method developed required the use of an over-all engraved roller for applying the thickened reducing agent, the dye being fixed in a saturated steam atmosphere. A patent was applied for and granted covering this process. This patent discloses the process of applying thickened solutions of caustic soda and sodium hydrosulfite with an over-all engraved roll to textile fabrics which have been previously printed with vat-dye pigments and suitable thickeners. Immediately after impregnation the fabric is treated in an air-free steam atmosphere to reduce and fix the dye. This patent is available for license royalty fee by any printers interested in operating the process. Inquiries should be directed to E I du Pont de Nemours & Co, Inc, Organic Chemicals Department, Wilmington, Delaware.

Over-all engraved rolls are not novel in the printing industry. Peroxide or Sitol* has been "pin-padded" on rayon goods printed in discharge patterns for many years. The reducing agent lost from printed cotton articles by excessive standing before aging has been often restored by overprinting the whole fabric with a paste containing alkali and reducing agent. With reasonable care the sharpness of mark of the print and the quality of the white has not been adversely affected by this second over-all printing operation in either instance. The same principle is used in our process except that, instead of using potash or soda ash as the alkali and sodium formaldehydesulfoxylate as the reducing agent, caustic soda and sodium hydrosulfite are over-printed. In practice, the fabric is printed in the conventional manner and dried. At this point the printed goods may be stored indefinitely. At some convenient time the cloth is led face down through a single color-printing machine or through a padder with an over-all engraved roll in place of the usual smooth bottom bowl where thickened caustic soda and sodium hydrosulfite are applied to the previously printed fabric face. This engraved roller is furnished in the usual manner and doctored with a doctor blade or by other suitable means. The goods then immediately enter an air-free steamer where they are steamed for approximately 15 seconds at 214-216°F. The delivery end of the steamer is immersed in the first box of an open soaper in which the goods are rinsed with cold water, oxidized and soaped.

THICKENERS FOR OVERPRINTING REDUCING AGENT——By using an all-over engraved roller for applying the reducing agent and alkali the choice of thickeners which can be used for printing the vat-dye pigment is extended. There is no need to use gums for printing the color, which will coagulate in the presence of alkali. In fact, the use of methyl cellulose or locust-bean gum is not indicated since these thickeners increase the time of steaming necessary to fix the dye. Any thickener can be employed depending on the particular quality of fabric or type of pattern being printed. Naturally, the color value obtanied will depend to some extent on the particular thickener used, these relationships being similar to those existing in conventional printing. For instance, textile gum and alginates print smoothly with sharp mark but give inferior color value compared with thickeners containing starches. We have found the best compro-

* Sitol is a registered trade-mark of E I duPont de Nemours & Co, Inc.

mise dye thickener for general use consists of a mixture of one part of 4% sodium alginate and three parts of 10% wheat starch. This is mixed with the dye paste to give a suitable printing viscosity.

The advantages of this thickener are that it is economical, has good flow properties, and the solids content of the paste is low. Printing thickeners have affinity for reduced vat dyes. With a low-solids paste, the amount of color absorbed by the thickener is less than with a high-solids paste, and the color value of the print is better. The absorption of caustic soda and sodium hydrosulfite in the chemical-impregnation step is facilitated, and the rate of transfer of vat leuco from carrier to cloth is increased with a low-solids vehicle. With this thickener, which contains only vat-dye pigment, and no assistants or chemicals, the fabrics are printed in the conventional manner from standard equipment and the goods are dried on cans or in a flue dryer.

No restriction is placed on the choice of thickening agent in the chemical overprinting paste except that it be compatible with high concentrations of caustic soda and sodium hydrosulfite. Gum tragacanth, British gum, starch-British gum mixtures, textile gum or the newer etherified or esterified starches are satisfactory. The concentration of chemicals in the chemical paste necessary for full color development is related to the fabric being run and to the depth of engraving used to apply the reagents. In practice, it is found that 5% of caustic soda and 5% sodium hydrosulfite, when applied at a 50% to 60% pickup from a suitably engraved cross-hatch roll, is ample to develop light, medium, and heavy shades on th majority of fabrics. This figure is not critical, and up to 90% by weight of the chemical gum can be applied to the fabric without causing a tendency to flush during steaming.

STEAMING PRINTS——Conventional rapid agers or other steamers in common use in the trade are not saisfactory for aging the impregnated fabrics. After impregnation it is essential that the fabric enter the steam atmosphere at once. Even after short exposure to the air, the sodium hydrosulfite present in the thin film deposited on the fabric surface decomposes, and the print is not developed. By placing the steamer throat near the applicator it is easy to insure that the fabric enters the steamer within 3 to 4 seconds. Further critical requirements are that the steamer must be absolutely air free and that the cloth, in its passage through the steamer, is supported only on the reverse side, the face must not touch carrying rolls nor rub on throats or other stationary parts of the machine.

We believe the most satisfactory design is a steamer constructed in the form of an inverted "U". This type of unit is simple and inexpensive to construct, and complete freedom from air is ensured when steam issues from the entry and exit legs of the steamer.

Saturated, live steam is fed into the horizontal section of the unit by three steam-inlet pipes placed lengthwise, one down each side and one in the center. These pipes are perforated on the bottom and covered with fine-mesh wire screen and cloth to prevent any condensate in the steam supply from impinging on the fabric being steamed. To prevent water drips from the roof of the unit, closed steam coils or a jacket should be installed. A steam pressure of 5 to 8 lb/sq in is sufficient in this jacket. It may be found advantageous to jacket the entry leg of the steamer and maintain a temperature of 230-240°F in this section. This high temperature zone rapidly heats the cold entering cloth to a temperature at which the dye reduces, thereby lowering the total steaming time necessary. In the remainder of the steaming chamber, a temperature range of 214-218°F is recommended. This temperature is produced with the low-pressure steam in the upper jacket. Should the temperature rise over 220°F, the color value and brightness of the finished print progressively decrease.

For convenience the exit leg of the unit may be immersed in the first box of an open soaper to form a water seal and prevent loss of steam. The first box of the soaping range should be a cold water overflow rinse, while the remainder of the boxes are set for oxidation, rinsing, and soaping as in conventional practice.

The particular form the steamer takes is not of importance and can be modified to suit space available in the plant. It can take the form of a unit with short entry and exit legs with a long horizontal portion or can be built like a tower ager with a small horizontal carry. Under some situations it may be found advisable to construct the steamer in the form of a triangle. However, if the properly impregnated fabric is steamed in an air-free atmosphere at a temperature below 220°F for approximately 15 seconds, satisfactory color value and fixation will be obtained, whatever is the precise design of the steaming equipment.

MILL TRIALS——Numerous mill trials have been made with our process. These large-scale experiments have confirmed the laboratory indication. Under proper operating conditions there has been no flushing of the printed pattern; the unprinted areas have not been stained or otherwise adversely affected during development. In these respects, prints equal in quality to present commercial standards have been produced. Full utilization of the printed color has been obtained. Striking increases in color values over conventional printing methods, forecast on the basis of closely controlled laboratory experiments, have been proven in practice. The process has been shown to be practical and adaptable to large-scale production.

Naturally, in comparison with established methods, our experience with the process is limited. The scale of operation has not been sufficiently large to evaluate the influence of many relatively intangible factors on finished cost. These are expected to be favorable. Continuous processes are more economical, as regards labor costs, than batch operation. Here too, the labor cost with our process where the goods are continuously steamed, rinsed, oxidized, soaped, and dried will be lower than when the conventional rapid aging method is used. Storage and moving of aged goods from ager to soaper is eliminated. Unlimited stability of the printed fabric allows more convenient vat printing. Scheduling of limited aging capacity is not necessary. The sometimes high proportion of seconds caused in conventional printing from decomposition of the reducing agent before aging is eliminated. Furthermore, the steaming conditions are always constant, and the problem of shaded goods from temperature rising in the rapid ager in processing long runs is not encountered.

ADVANTAGES OF NEW PROCESS ——There are processing advantages, apart from color cost, in being able to extend the line of printing types to include all vat dyes. The customer's requirements of a particular fastness property, particular shade or lower printing cost can be more easily satisfied. While these factors will all result in savings to the printer, it is not possible to give any estimate of their magnitude until many months of full-scale production have been run on all types of fabric. Other aspects of the printing cost can, however, be estimated, and controlled laboratory evaluations indicate that significant savings in dyes, chemicals, and thickeners will be realized by this process.

The vat dyes presently used by the textile-printing industry are those which have been found to give the best color value when applied by the conventional printing process. These same dyes, when printed and developed by the new technique, show an increase in color value of from 10% to 50%. This increase in color value will be reflected in a lowered color cost of like degree. Therefore, even with conventional printing types, the over-all color cost may be reduced by as much as 25 to 30%. This cost will be further reduced by selecting dyes that cannot now be printed but which show exceptional color value in this proc-

(Concluded on Page P278)

Western New England Section——

SILICONES IN THE TEXTILE INDUSTRY*

C E GIBSON and F L DENNETT
Dow Corning Corporation

C E Gibson

The development of silicones was initiated by the search for a heat-stable, water-repellent material for use with glass fabrics as electrical insulating materials. From this beginning a large number of silicone compounds have been developed, including a durable silicone water repellent for synthetic fabrics and blends. In addition to water repellency, durable to both dry cleaning and laundering, this product imparts to fabrics improved hand, better tear and abrasion resistance and a marked increase in sewability.

* Presented at Rapp's Restaurant in Shelton, Conn, on Nov 14, 1952, by C E Gibson.

F L Dennett

THE FORMATION OF SILICONES
BY THE GRIGNARD AND DIRECT PROCESS METHODS

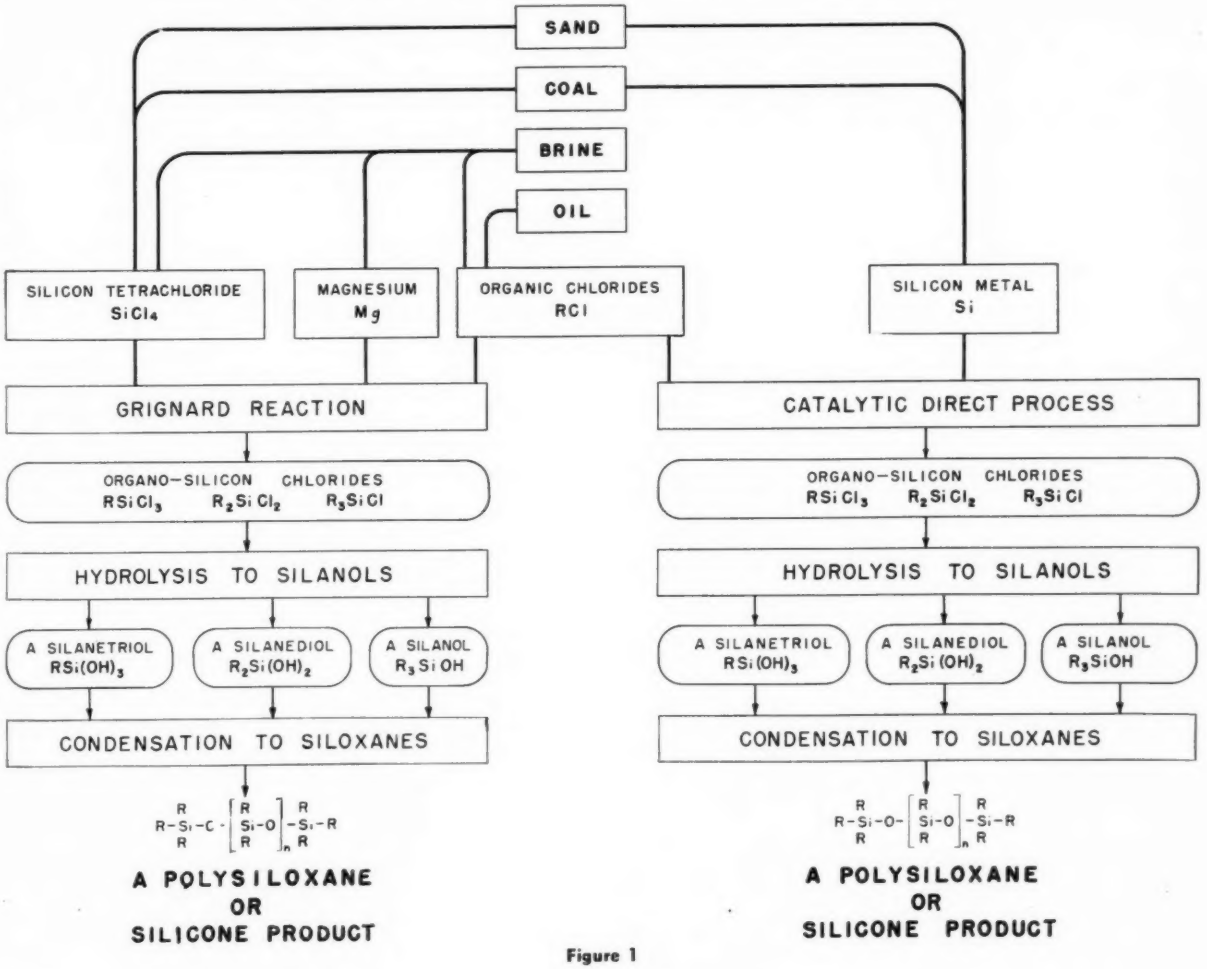


Figure 1

INTRODUCTION

LESS than two decades ago organosilicon compounds, now known by the name *silicones*, were laboratory curiosities. Today these materials have an important place in many commercial fields. In the textile industry we find silicones used as electric-motor insulation, antifoaming agents, high-temperature greases, heat-resistant paints, and as water-repellent textile finishes.

The development of glass yarns and the successful weaving of glass fabrics by the textile industry is largely responsible for initiating early research on silicones. This search for a heat-resistant varnish to be used as a complement to glass in motor insulation was the beginning of an industry producing more than a hundred materials which are solving many hitherto insolvable problems.

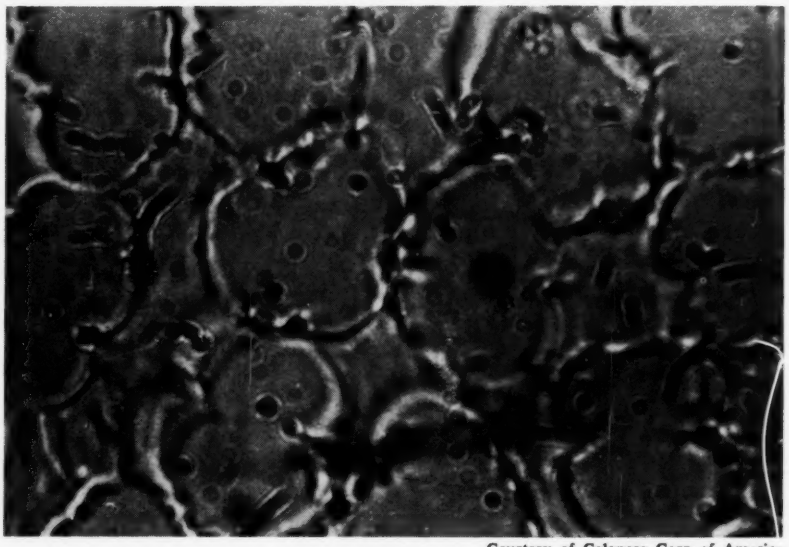
Silicones are partly organic and partly inorganic in composition, thus combining the advantages of organic compounds, such as plastics, with much of the heat stability and dielectric properties of glass and mica.

MANUFACTURE —— Two processes are now commercially employed in the manufacture of silicones (Figure 1). Chlorosilanes are produced by either the classic Grignard reaction or the direct method. Hydrolysis of these materials results in a molecular structure of alternate silicon and oxygen atoms having one or more hydrocarbon radicals attached to the silicon. The length of the silicon-oxygen-silicon chain, the amount of cross linking and the organic groups employed greatly influence the properties of the resulting product.

PROPERTIES——Water repellency and durability are two basic properties of all silicones. Methylpolysiloxanes probably exhibit these properties to the greatest degree. These materials as originally produced could only be used, however, on glass or asbestos fabrics since curing temperatures required for the development of maximum water repellency are too high for organic fibers. Further research was initiated to develop a silicone applicable to organic fabrics. This product, known as DeCetex 104, was offered to the textile trade in the spring of 1949. It is a remarkably durable silicone water repellent.

SILICONES ON TEXTILES

DeCetex 104 is designed specifically to impart durable water repellency to synthetic fibers and to blends of these fibers with natural yarns. It is a viscous, silicone high polymer supplied at 65% solids in methylene chloride, a nonflammable solvent. DeCetex 104 is colorless, contains no corrosive chemicals, and imparts no odor to a treated fabric.



Courtesy of Celanese Corp of America

Figure 2

Photomicrograph showing cross sections of acetate filaments treated with 2% DeCetex 104. The light-colored ring is absent in untreated fibers. Note almost complete coating of periphery.

Concentrated emulsions of this silicone can be easily prepared from specific agents in proper emulsifying equipment (*1*). Solvent solutions of DeCetex 104 may also be employed if the finisher is equipped to handle a solvent system. Conventional padding equipment may be used in applying a silicone finish.

A retention of 1 to 2% silicone solids based on the air-dry weight of a fabric is usually sufficient to produce optimum water repellency and maximum durability. The required pick-up will vary slightly with fabric construction and fiber content. The treated fabric is dried, and water repellency is developed by curing for 4 to 10 minutes at 300 to 320°F in accordance with weight of cloth.

Development of maximum water repellency is a function of the time and temperature of the curing cycle above a minimum temperature of about 290°F. Some fabrics having a high softening point may be cured in 30 seconds at 460°F with some types of equipment. It is believed that the curing cycle orients the silicone on the surface of the fiber in such a manner that the organic groups of the silicone polymer are outward where they are able to exhibit optimum water repellency.

The silicone polymer appears to be tightly bonded to the fiber and completely envelopes each thread. The photomicrograph (*2*) shown in Figure 2 reveals the silicone finish surrounding acetate fibers. To establish definitely the presence of this coating, treated acetate-suiting fabrics were soaked for 24 hours in acetone to dissolve the acetate. The remaining thin-walled tubes of silicone polymer are shown in Figure 3. An enlargement of the inner surface of one of these silicone tubes will even show the surface irregularities of the fiber. This characteristic silicone covering can be observed even when the silicone pickup is as little as 1% based on the air-dry weight of the fabric.

In addition to water repellency, the silicone finish described above imparts several important characteristics to the fiber. A

TABLE I

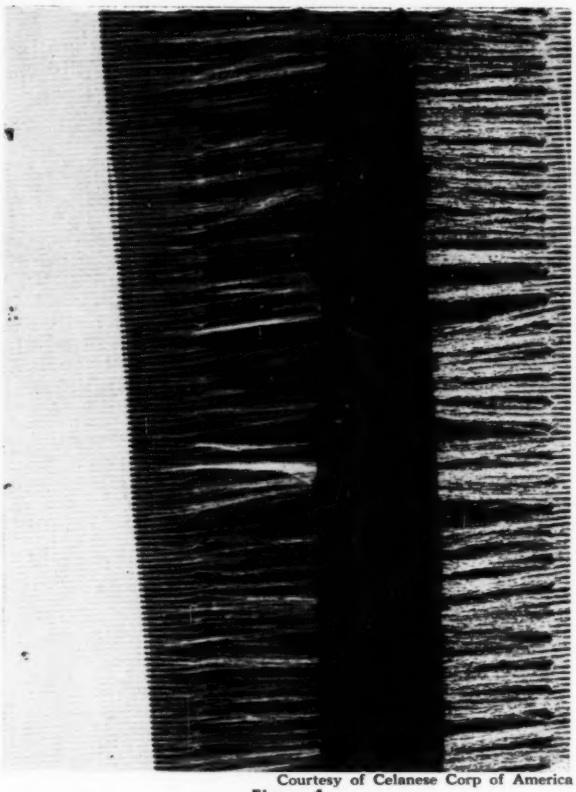
EFFECT OF DE CETEX 104 ON 100% ACETATE DRESS-SUITING FABRIC

Property	*Original As Rec'd*	*Original Water Cured*	*0.25% Silicone*	*0.5%*	*1.0%*
AATCC Spray Rating	0	0	90	100	100
Monsanto Wrinke-Recovery——Angle					
Warp——5 min	101	101	114	130	136
Warp——24 hr	133	127	146	155	157
Filling——5 min	92	94	114	129	129
Filling——24 hr	127	125	152	156	153

Courtesy of Celanese Corp of America

Figure 3

Photomicrograph of 2% DeCetex 104 treated fabric. Teased-out portion has been acetone extracted for 24 hours to remove soluble acetate fiber. Fiber-like remnants are thin-walled tubes of the silicone polymer formed around each filament.



Courtesy of Celanese Corp of America

Figure 4

Photograph showing the relative sewability of treated and untreated acetate taffeta. The untreated sample at right shows 50 to 80 cut ends per 3" length on high-speed sewing. Sample at left treated with 0.25% DeCetex 104 shows 0 to 5 cut ends per 3" length under the same sewing conditions.

soft, rich, full hand is produced, which remains evident throughout repeated launderings and dry cleanings.

EXPERIMENTAL

Wrinkle recovery, as measured by the Monsanto wrinkle-recovery method, is improved as indicated by the data (2) on acetate suitings shown in Table I.

Increased flex-abrasion resistance, measured by the CSI Stoll Quartermaster Universal Wear tester, of fabrics treated with DeCetex 104 is shown in Table II. This increase is evident when the silicone finish is used alone or in conjunction with conventional urea-formaldehyde crease-resistant resins.

Tear resistance of fabrics treated with this silicone water repellent shows marked increase in both filling and warp directions. Data for four different samples are shown in Table III.

Some fabrics which meet all of the usual specifications cannot be sewed into acceptable garments because the yarn is damaged by the sewing needle. The sewability of such textiles containing thermoplastic fibers can be greatly enhanced by a silicone water-repellent finish. The improvement in sewability produced by silicones is evident in Figure 4 showing treated and untreated acetate lining fabric sewed at 4000 stitches per minute on a No. 241-11 Singer machine. Note the lack of needle cutting in the treated fabric.

TABLE II

FLEX ABRASION RESISTANCE TESTS

Treatment	*Viscose-Acetate Gabardine*	*Viscose-Acetate Plain Weave*
	Cycles Until Failure	
None	243	194
Silicone finish	429	662
Urea-formaldehyde resin	87	155
Urea-formaldehyde and silicone finish	127	245

TABLE III

INCREASED TEAR RESISTANCE OF FABRICS TREATED WITH SILICONE

Fabric	*Per cent of Silicone Pickup Based on Fabric Weight*	*Per cent Increase in Tear Resistance*	
		Filling Direction	*Warp Direction*
1	1.28	34.00	37.60
2	2.06	109.50	80.40
3	2.02	71.00	38.00
4	1.92		21.60

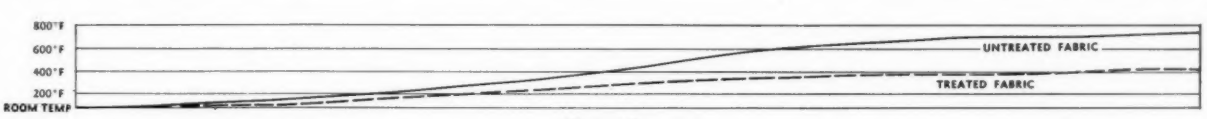


Figure 5

Oscillograph of Needle Temperatures in Sewing Silicone-Treated and Untreated 4-Ply Orlon Fabric

TABLE IV

EFFECT OF COMMERCIAL DRY CLEANING ON SILICONE-TREATED FABRICS

Cleanings	SPRAY RATINGS: Acetate Spun Filling Filament Warp	50/50 Acetate and Spun-Rayon	Spun-Acetate Fabric	Acetate-Filament Warp and Filling
0	100	100	100	100
1 cleaning, no rinse	80	90	80	90
2 cleanings and rinses	90	90	80	90
3 cleanings and rinses	80	80	80	80

TABLE V

LAUNDERING DURABILITY OF 50/50 RAYON-ACETATE FABRICS COMMERCIALLY TREATED

Sample	Per cent Silicone Pickup	Spray Ratings: Original	Wash 1	Wash 2	Wash 3
1	.86	100	90	90	90
2	1.10	100	90	90	90
3	1.00	100	90	90	90
4	1.20	100	90	100	90

Needle temperatures and resulting needle-hole fusions are reduced by the silicone finish. Figure 5 shows a comparison of needle temperatures resulting when treated and untreated 12-oz fabric of "Orlon" acrylic fiber is sewed at 3000 stitches per minute with an unthreaded needle.

Improvement of hand, increased flex abrasion and tear strength, and better sewability are all effects that are obtained with a silicone finish in addition to water repellency and resistance to water-borne spots.

Water repellency having exceptional durability to dry cleaning and laundering has been noted on synthetics and blends of synthetic and natural fibers treated with DeCetex 104. Spray ratings on four fabrics commercially treated with a silicone water repellent and subjected to three dry cleanings are shown in Table IV. These fabrics were cleaned with a standard load in a 30 x 30 Stoddard-solvent washer in the presence of a dry cleaning soap and prespotter solution. The load was run with the soap and prespotter solution for 25 minutes without filter circulation. Samples, which were not rinsed, were removed after the soap cycle, extracted and dried. The balance of the load was then rinsed for 20 minutes with fresh solvent with filter circulation. The samples were then extracted and dried at 145°F for 25 minutes before conditioning and testing.

Durability of the silicone finish to laundering is shown by the data presented in Table V. Test samples were laundered in a reversing washwheel with 0.1% soap in water at 120°F for 40 minutes followed by 5 rinses at 100°F. Note the exceptional spray ratings obtained after three launderings with a pick-up of only about 1% silicone solids.

SUMMARY

Silicones have proved their usefulness in almost every industry during the past few years. A silicone water repellent has been developed for synthetic textiles. This water repellent may be easily applied with conventional equipment from solvent or emulsion systems to give water repellency which is extremely durable to dry cleaning and laundering. In addition, the silicone finish imparts excellent hand, better sewability and improved physical properties to synthetic fabrics.

Other silicones, such as antifoaming agents, high-temperature lubricating greases and electrical insulating materials, have also proved their usefulness in the textile industry. And all of these silicone products will probably prove to be no more than the vanguard of a host of silicone materials of primary interest to the textile industry.

REFERENCES

(1) Silicone Notes 1044a, Dow Corning Corporation.

(2) Von Gorder, Duke, and Fortess: "The Resin Finishing of Acetate Fabrics," Presented before Division of Paint, Varnish and Plastic Chemistry at ACS Atlantic City Meeting, September, 1952.

Vat-Print Development—

(Concluded from Page P274)

ess. Among these are anthraquinone-type vat browns, reds, olives, and blacks. In addition to a decreased color cost, the brightness of all types is improved, and the fastness to crocking and washing is significantly bettered.

Economies may also be achieved in the printing thickener. For example, a conventional vat print thickener will cost approximately $0.80 per gallon. With a medium engraving this one gallon will print about 80 yards of 40-inch goods in a pattern with 50% coverage. Therefore, the cost per yard for printing thickener in this instance will be one cent per yard, exclusive of dye cost. In the new process the cost of the thickener used for printing the vat dye is about $0.10 per gallon. The cost of the chemical paste applied from the over-all engraved roller is $0.16 per gallon, which figure includes gum and chemicals. Assuming the same yardage per gallon with both color pastes and allowing a 50% pickup of the chemical paste, the total cost for thickening and chemicals is 5/8¢ per yard. In this hypothetical pattern the savings in chemicals and thickener over the conventional process is 3/8¢ per yard. As the coverage of the pattern decreases, so will the cost advantage of the new process over the old decrease. In patterns where the print coverage is less than about 25%, thickener cost will be higher with the new technique since the whole surface of the fabric is impregnated with the chemical paste and not just the printed areas. This slightly greater thickener cost will be compensated by the greatly increased color yield obtained from the dyestuff. Some patterns have exceptionally low pattern coverage, for instance, printed shirtings. In these styles the thickener and chemical cost will be considerably higher than the conventional process. We believe the ability to use dyes that are exceptionally fast-to-light, laundering, and chlorine will offset the slightly higher thickening costs.

It is beyond the scope of this paper to discuss all the phases of the process which have been investigated during many years of laboratory developmental investigation. Additions to the printing and chemical paste, the effect of various thickenings alone and in combination have been studied and their effects evaluated. All this work has shown that the principles of our process of continuous vat-print development are sound, while growing acceptance of the technique by the trade has confirmed this view. Savings resulting from increased color yields and savings in thickeners are significant, but even greater economies may be effected by the adoption of a continuous development process for vat prints. It is our belief that, with this process, printed fabrics ideally suited to consumer end uses will be available with resulting increased yardage for the printing trade.

NEWS

J Robert Bonnar
TCMA Guest Speaker

• TCMA to Present Contest Award at N Y Meeting

At the next dinner meeting of the Textile Chemical Manufacturers Association, to be held May 15 at New York's Hotel Roosevelt, E E Rettberg, Jr, TCMA president, will present a $100 prize to the winner of that organization's seal contest.

The regular program will feature, as guest speaker of the evening, J Robert Bonnar, president of the American Association of Textile Chemists and Colorists.

Joseph B Evans, Dexter Chemical Corporation, cochairman of the arrangement committee along with John M Jester, Amalgamated Chemical Corp, will be the toastmaster. Other committee members include: J Everett Allen, Arkansas Company, Inc; Martin B Friendman, Warwick Chemical Co, and J J McGuinness, Dexter Chemical Corporation.

• Commonwealth Discontinues Dyestuff and Textile Chemical Manufacturing

Commonwealth Color and Chemical Company, New York, has discontinued the manufacture of dyestuffs and chemical specialties, effective April 15.

Arrangements have been made with Nyanza Color and Chemical Co, Inc, 109 Worth Street, New York 13, N Y, to continue the manufacture and sale of the majority of these products.

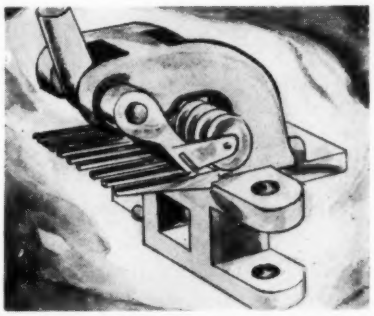
It is understood that a majority of the sales staff as well as others formerly in the office and technical departments of Commonwealth will join the staff of Nyanza.

• HUNTER "VAPOJET" FEATURES STEAM AS DRYING MEDIUM

THE "Vapojet," a recent innovation in cloth drying, was formally introduced to the trade on April 10th by the James Hunter Machine Company, North Adams, Mass, as "the first machine to use steam as a drying medium, rather than hot air."

Based on a European development and designed and built under license from Julien Dungler of Basle, Switzerland, the Vapojet Dryer impinges superheated steam at high velocity on both sides of the fabric. Chief advantages of the unit appear to be the speeds of drying (said to be far in excess of any so far realized in the field), elimination of shading and undesirable overdrying through controlled drying, and more efficient evaporation per foot of floor space.

Prominent among the machine's features are the telescopic nozzles located between the tenter tracks within 3/16" of the fabric. These adjust automatically when the tracks are moved in or out for different fabric widths. The tenter clip itself, manufactured for Hunter by Marshall and Williams Corp, Providence, R I, can be overfed, giving the operator of the clip tenter the advantages of a pin type. It is claimed that up to 20% overfeed can be accomplished with firmness and accuracy. A comb-type lower plate permits the overfeeding while insuring uniformity of drying of the selvedge.



Patented clips designed to overfeed as much as 20% on a wide variety of fabrics. Comb-type lower plates permits uniform drying of selveges.

The Vapojet system has also been designed for use in predryers, where the cloth is pulled either horizontally or vertically through the enclosure, depending on the application, and the nozzles are not telescopic. However, each one is 3/16" from the cloth, the same as in the tenter. The predryer, useful for increasing output on existing installations, has proven valuable in the case of resin work so that the original setting of the resin can take place before it marks off on cans, rolls or clips in the regular dryers.

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• Ecco to Distribute Exsize-T in New England

Eastern Color and Chemical Company, Providence, R I, has been appointed sole distributor in New England for Excise-T, it is announced by the Pabst Brewing Company, manufacturers of the product. George B Perlstein, manager of the firm's Industrial Products Division, stated that the liquid enzyme concentrate is now being packed in new and attractive lithographed drums.

Principles of the distributing company for Exsize-T, located at 137-139 Canal St, Providence, are Michael and Joseph Shepard.

• New Dye-fixing Agent Added to Hart Products Line

Hartofix, a new cationic dye-fixing agent for imparting water resistance to direct dyeings on cotton, rayon and other cellulosic fibers, has been introduced by Hart Products Corp, New York.

Available as a straw-colored, viscous liquid, Hartofix may be used alone or in conjunction with copper salts to increase the water and wash-fastness of a wide range of direct dyes, according to the manufacturer.

Hart Products Corp suggests application of the new dye fixative for eliminating bleeding and staining of prints during wet handling and wet pressing, eliminating perspiration staining on dyed or printed fabrics, imparting water resistance to dyed yarns for knitted or woven sportswear, improvement of wash resistance of cotton and rayon yarn for hose, eliminating staining of discharge prints where ground has been dyed with a direct color, and for use in dyeings or prints when applying resin finished from warm baths.

Vapojet—

(Concluded from Page 279)

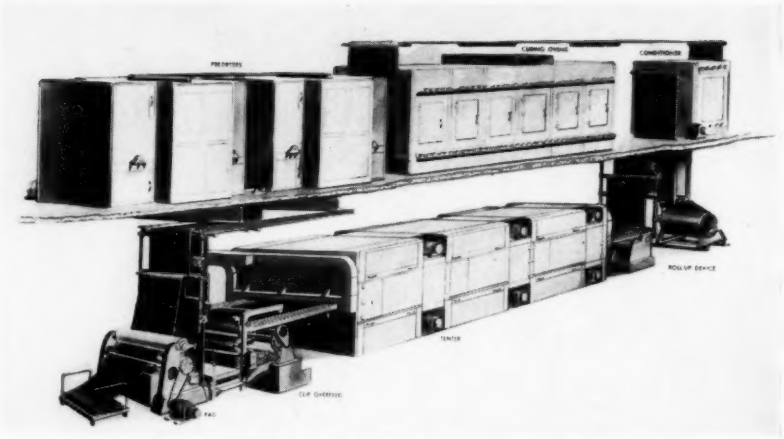
Still another application of the system is the tensionless machine, which is designed with staggered nozzles blowing against driven rolls, rather than against the air pressure of the opposed nozzle. By the use of an overfeed roll, the cloth can be fed into this machine in a slack condition to obtain complete relaxation in both wrap and filling.

The tenter itself, as well as the predryer and the tensionless machine, reportedly works on the following basis:

The machine is made in 10-ft sections, each section containing a fan, copper conduction type heaters, plenum chamber and nozzles, above and below the travel line of the cloth. The dryer uses standard conduction type heaters, and with the fans turned on the temperature within the housing is raised to 300°. Before the introduction of the cloth, a valve is opened, allowing live steam, under pressure, to force the air from the enclosure. The heat of the steam, which at atmospheric pressure is 212°, is raised to 300° by circulating through the heaters, i e, it is superheated 88°. From this point additional steam required to maintain the vapor atmosphere is provided by the moisture evaporated from the cloth. Any excess escapes into the airlock and is exhausted. When the machine is started, the fabric is admitted into the enclosure and the superheated steam blown onto the cloth at a speed in excess of 6,000 feet per minute.

The vapor at the entering end is partially condensed over the cold surface of the cloth. The liquid with which the fabric has been impregnated and the condensing of the vapor liberate latent heat, which raises the temperature of the impregnating liquid to the boiling point. The fluid on the surface is evaporated, but the impregnating liquid contained in the fiber is transformed into vapor; the products in solution are kept inside the cloth as solids, while the vapor goes to the surface by expansion without carrying off any of the solids, a significant factor in prohibiting migration of finish.

It is notable in the Vapojet operation that the temperature of the liquid in the cloth is raised almost instantaneously. In the use of an air dryer, the temperature of the impregnating liquid increases slowly and reaches the boiling point only when the liquid is practically evaporated. By using superheated steam and no exhaust other than pressure, the drying medium is recirculated through the heaters to replace any temperature drop. Also, a slight amount of steam vapor is carried in the cloth as it is delivered from the dryer. This vapor condenses at room temperature and provides a conditioning effect because the cloth will always contain a desirable residual moisture content.



The first installation of the predryer and overfed tenter is now in operation at the Cliffside Dyeing Corporation, Paterson, N J. This complete Hunter range consists of a pad, two predryers, a 3-section overfed clip tenter, a curing oven, a cloth conditioner and a batcher. The complete process of impregnating, drying, curing, conditioning and batching is accomplished continuously. To save floor space, the range is on two levels.

• Nissen Writing Tubes

Permanently marking, burst-proof writing tubes, developed a few years ago by John P Nissen, Jr Company, Glenside, Pa, continue to find new applications in the textile trade. Using indelible inks, the tubes are specifically designed to reduce cut offs and provide permanent identification.

Nissen Dye Resist Colors are said to resist soaping, washing, degumming, fulling, caustic, carbonizing and dyeing.

Nissen Bleach Proof Color will not bleach out and will withstand hard usage, weathering and washing, it is claimed. It is said to be particularly well adapted for marking underwear, cotton goods, uniforms, bags, canvas goods, etc.

The writing tubes are equipped with various size ball-point attachments for different applications.

Nissen Writing Tube

OBITUARY

WALTER E BLAIR

WALTER E BLAIR, Assistant to the President of Solvay Process Division, Allied Chemical & Dye Corporation, died suddenly on March 23rd while vacationing with his wife at Sarasota, Florida.

Associated with Solvay throughout practically his entire business career, Mr Blair had held positions of Director of Sales and Manager of the Product Development Department before being appointed in July, 1952 to the position he held at the time of his death.

Interment took place in Winona, Minnesota, on March 27th.

PAUL SCHLOSSER

PAUL SCHLOSSER, research manager of Rayonier Incorporated, died on Thursday, March 12, at the age of 59.

Dr Schlosser joined the research division of Rayonier Incorporated at Shelton, Washington, in 1935. He has long been identified with the field of cellulose chemistry and rayon, and made important contributions to the successful development of wood cellulose as a basic chemical raw material. Dr Schlosser studied under Prof Emil Heuser at Darmstadt, Germany, before coming to this country. Subsequently, he worked with Glanzstoff in Germany and Woonsocket Rayon Company.

NAMES IN THE NEWS

K R J Horner

C J Weidmann

W H Kieffer

THE opening of their new $18,000,000 vat dyestuffs plant at Toms River, N J, scheduled for this Spring, has prompted several important administrative personnel moves by Ciba Company, Inc.

Frank B Common, Chairman of the Board of Ciba States Limited has announced the appointment of HARRY B MARSHALL as Vice President of Ciba States Limited in charge of the Toms River Division and DAVID B DYCHE as Vice President of the Company. Dr Marshall continues as President of Ciba Company, Inc, while Mr Dyche continues as Treasurer of Ciba States Limited and President and Treasurer of Cincinnati Chemical Works Incorporated.

Meanwhile, KEITH R J HORNER, vice president and general manager of the Ciba Company, Ltd, Montreal, has been named executive vice president of Ciba Company, Inc, a new post, with headquarters in New York City. WILLIAM H KIEFFER, for the last three years assistant to the president of Ciba Company, Inc, has been appointed general sales manager. SAMUEL I PARKER, whom he succeeds, continues as vice president and will have other administrative responsibilities. CHARLES J WEIDMANN, manager of the technical department of the Montreal unit, will become technical director of Ciba Company, Inc.

Appointments of executive personnel at Toms River continue. The following are effective immediately:

FRITZ MAX, general manager

PHILIP KRONOWITT, assistant general manager

C S CARLSON, plant comptroller

CHARLES S MODYS, personnel manager.

H WICKLIFFE ROSE is leaving American Viscose Corporation to join The Linen Thread Company, Inc, Paterson, N J, on June 1 as General Manager. On July 1, DAVID LEONARD MALCOLM, president of Linen Thread, will retire after completion of fifty years of service with that company. Mr Rose will succeed Mr Malcolm as president after that day.

Born in Dundee, Scotland, Mr Malcolm came to this country in 1890, and after attending Lawrenceville School and the Philadelphia Textile Institute he began his career in the dyeing department in 1903. In subsequent years he filled various positions in the Company, including that of Vice-President in charge of manufacture, and in September 1947 was elected to President and chief executive officer.

Mr Rose is currently general assistant to the president of American Viscose Corporation.

THE appointment of PAUL A KEENE to the post of Assistant to the Director of Development, Solvay Process Division, Allied Chemical & Dye Corporation, became effective April 1. He will continue to make his headquarters at Syracuse.

Mr Keene, with Solvay since 1919, was for several years Chief of Research.

R R Menti

AT a recent meeting of stockholders of the Rossville Dyestuff Corporation, RONALD R MENTI was elected president of the Staten Island, N Y, firm, and HOWARD F JOHNSON, vice-president in charge of sales.

Mr Menti is currently associated with United States Rubber Company's Textile Division. Mr Johnson was with Silk City Chemical Company prior to joining the Rossville organization.

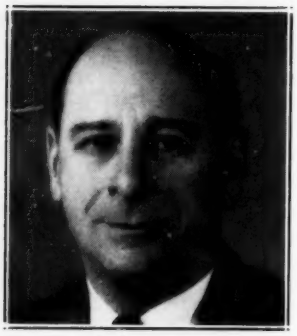
ROMEO J PREZIOSO has been named plant Manager of Dye Specialties Corporation, Inc, 26 Journal Square, Jersey City 6, N J.

R WOLCOTT HOOKER, formerly vice-president in charge of sales for Hooker Electrochemical Company, has been elected vice-president and has been given broader responsibility with respect to overall management of the company. Among his other duties, Mr Hooker will continue to be active in sales work. ROBERT E WILKIN, formerly general sales manager, was elected vice-president and general sales manager, while FRANK W DENNIS, formerly director of industrial relations, was elected vice-president in charge of industrial relations.

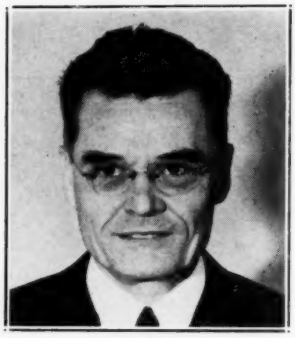
THREE vice-presidents of the American Cyanamid Company are leading campaign divisions for the New York Heart Fund.

W G MALCOLM, in charge of the Lederle Laboratories Division of the Company, heads the Heart Fund's drugs and pharmaceuticals division. ROBERT B FISKE is serving as Dr Malcolm's associate chairman.

The campaign's chemical division is headed by ARTHUR J CAMPBELL who is making an appeal throughout the chemical industry in the Heart Fund's behalf. Both Dr Malcolm and Mr Campbell are members of Cyanamid's board of directors.



O Bezanson



H H Bitler

D L Griswold

THE elevation of President OSBORNE BEZANSON to Chairman of the Board of The Chemstrand Corporation and naming of HENRY H BITLER as President and Chief Executive Officer of the corporation were announced April 1. The administrative appointments become effective December 1.

Mr Bitler, in joining Chemstrand officially on that date, completes 33 years with American Viscose Corporation, with whom he was most recently general manager of acetate and Vinyon manufacturing. Mr Bezanson, formerly a vice president and officer of Monsanto, has been president of Chemstrand since November, 1950.

Mr Bezanson, in announcing the new executive structure to staff department heads in Decatur, said the arrangements were ratified at the Chemstrand board meeting held recently in New York. In their respective capacities, both will be members of the Chemstrand board.

Meanwhile, the Board was called upon to tender the resignation of WILLIAM M RAND in order that he might accept an appointment in the Eisenhower administration, as a deputy director of the Mutual Security Agency. Mr Rand had been a member of the Board since the company was organized early in 1949.

Other personnel news of note from Chemstrand concerns the appointment of five new members of the Research and Development Department at Decatur and seven supervisory appointments to the nylon manufacturing and processing facilities now under construction at Pensacola, Fla.

At Decatur: *GEORGE E HAM becomes group leader in exploratory research on synthetic fibers; CLARENCE I JOHNSON, chemist, organic process research; RUTHERFORD B THOMPSON, JR, research chemist, polymer section; EDWARD H SUNDBECK, group leader, general process section; and PETER B HERMES, textile research.*

At Pensacola: *CLARENCE E RANNEFELD becomes technical supervisor, intermediates area; FRANK S RIORDAN, JR, technical supervisor, quality control; STANLEY T ROLFSON, LAWSON R HANKS, JR, and LOUIS D SCOTT, technical supervisors in yarn; GEORGE F MAYNARD, technical supervisor, intermediates area; and JAMES B McKOY, JR, technical group leader in yarn.*

CALCO Chemical Division, American Cyanamid Company, has announced that, effective July 1, DONALD L GRISWOLD will be transferred to the head office at Bound Brook, N J, as assistant to the manager of the Dyestuff Department. Since 1947, Mr Griswold has been manager of the Calco Chemical Division, North American Cyanamid Limited, with headquarters first in St Lambert and, since September 1952, at Cyanamid's new consolidated office and manufacturing building in the Town of Mount Royal. In his 5½ years in Canada he has directed the sales of dyestuffs, pigments, and textile resins manufactured by the company.

J R BURKETT will be transferred from the Dyestuff Sales Department at Bound Brook to manage the business of the Calco Division at Montreal.

E A SKEAD is now a member of the sales organization of United Chemical Products Corp, Jersey City, N J. He joins United after having been connected with Commonwealth Color & Chemical Co during the past 22 years.

J J Valter

METRO-ATLANTIC, Inc. has added JOHN J VALTER to the Southern and service staff.

Mr Valter, with over 25 years' experience in textile processing, will cover North Carolina and Virginia from Metro-Atlantic's office at Greenville, S C.

J K Lindsay

JAMES K LINDSAY was elected secretary of Heyden Chemical Corporation at a meeting of the Board of Directors on March 12 to take the place of PAUL van der STRICHT who has resigned. Mr Lindsay was previously a partner in the law firm of Fulton, Walter and Halley, New York.

H E Trotter

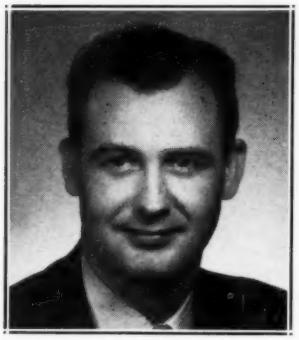
APPOINTMENT of HERMAN E TROTTER as Buffalo, N Y, representative of B-I-F Industries has been announced by that firm. He began handling sales of Builders-Providence, Inc, flow meters and controllers and Omega Machine Co chemical feeders in the area March 15 from B-I-F's offices at 3053 Main Street.

J F Warner

JOHN F WARNER has joined D B Fuller & Co, Inc, New York, as vice president in charge of research and development, where he will devote his time to the development of new techniques and processes as well as coordination of the New York operations. Fuller maintains a printing and finishing department at Easthampton, Mass.

Mr Warner was formerly an executive staff assistant of Cluett, Peabody & Co, and previously a director of Riegel Textile Corp and presdent of Riegel Development Laboratories, Inc. He was also vice president of American Cyanamid and director of development for the Calco Chemical Division.

UNDER the auspices of the U S Department of Commerce and the International Bank of Reconstruction and Development, BAY M KERIMAL, textile advisor to the Industrial Development Bank of Turkey visited the Lowell Textile Institute last month on an inspection tour of the Massachussetts college's textile departments.



E Blakely, Jr

ERNEST BLAKELY, JR, has accepted the position of Southern sales representative with the Chas S Tanner Co, Providence, R I. He will be located in Greenville, S C, at which point warehouse sotcks will be established in addition to the Company's office in Charlotte, N C.

Mr Blakely was formerly with Frank Ix & Sons and has just completed a tour of service with the USAF.

RAYMOND W McNAMEE, superintendent of the research and development department of the Carbide and Carbon Chemicals Company, South Charleston, W Va, has been chosen by the American Chemical Society's Georgia Section to receive the 1953 Herty Medal. The award, sponsored by the Chemistry Club of the Georgia State College for Women, is given annually for outstanding contributions to chemistry in the Southeast.

The 21st impression of the medal will be presented to Dr McNamee at the annual Herty Day celebration on the College campus at Milledgeville on Saturday, May 2.

R C Carey

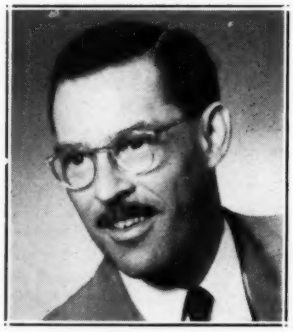
RAYMOND C CAREY, regional representative in Western Connecticut, New York and New Jersey for General Dyestuff Corporation, has been assigned to the Army General Staff, assistant chief of staff, G-4, Logistic Division, in Washington.

For Mr Carey, who holds the rank of Major, this new reserve assignment terminates a previous mobilization designation in the office of the Chief, Chemical Corps, Army Special Staff.

JOHN L EICH, formerly assistant sales manager of the New York Sales Branch, General Dyestuff Corporation, has been named resident manager of the Chicago Sales Office. He fills the post formerly held by E R HEINTZ, who has been appointed resident manager of the Philadelphia Sales Branch.

Mr Eich has been associated with GDC since 1934. Prior to that time, he was in the upholstery and fabrics division of Cheney Bros for nine years.

F E Hilger



W G Luqueer

B B Meady

WITH the opening of their Philadelphia Office at 49 Rittenhouse Place, Ardmore, Pa, Verona Dyestuffs (A Division of Verona Chemical Company) has named F E HILGER manager. He will be assisted by ROBERT E HILL. Both men have long been associated with the industry, Mr Hilger in the Midwest district, and Mr Hill, in the Providence and Philadelphia areas.

Other recent additions to Verona's staff include W G LUQUEER, as a New York representative, and (as previously noted) BENJAMIN B MEADY, as a technical salesman for dyestuffs and auxiliaries. Mr Luqueer began his career with U S Finishing Company and later went with General Dyestuff Corporation as a sales representative. Mr Meady, who is located in Verona's New England Office at 49 Westminster St, Providence, R I, was with General Dyestuff Corporation from 1931 until January 31st of this year.

GEORGE M WALKER has been elevated to a vice presidency in the Chemical Division of Koppers Company, Inc, Pittsburgh, Pa. An assistant v-p since 1951, Mr Walker is manager of the Project Department of the Chemical Division, the unit responsible for the planning and execution of Divisional expansion activities.

Prior to assuming this post, Mr Walker organized and spent five years as manager of Koppers' Central Control Station.

LEO W RAINARD has resigned as director of research for the Carpet Division of Alexander Smith, Inc, Yonkers, N Y, with no announcement as to his future plans. According to A G Ashcroft, vice president, research and development, no replacement for Mr Rainard will be named.

Prior to joining Alexander Smith in 1947, Mr Rainard held positions with Atlantic Research Associates, General Latex and Chemical Co and the Institute of Technology.

SEVERAL changes in the sales department of the Chemical Division of Celanese Corporation of America have been announced as follows:

RICHARD SCHWAB is moving from the New England territory to become manager of the Detroit area. WALTER LAUER, formerly of the plasticizer department in New York, will be responsible for sales in New England with headquarters in Boston.

ARTHUR DOWLING has joined the Division as advertising manager, and in that capacity will be responsible for all advertising and sales promotion activities in the Division.

In the line with the expanding activities of the Division, the following product managers have been named to assist the New York sales office on policy and administrative affairs and to co-ordinate their activities with district offices:

WILLIAM C GOODWINE——plasticizers and allied products.

T G DAVIS——intermediates.

NORMAN BAKER——solvents.

JOSEPH J KRAJICEK has been added to the engineering staff at Edwal Laboratories, Ringwood, Illinois, manufacturers of fine organic and photographic chemicals. Until recently, he was associated with Armour & Co in Chicago, Ill.

Mr Krajicek's duties at Edwal Laboratories will pertain to plant design and maintenance.

J P Clancy

E L Spencer

C T Burgess

E W Sack

AMONG recent changes in Emery's Chemical Sales Staff is the shift of J R CLANCY from the southern area to New England. He will join J M WASHBURN in the responsibility for sales of all Emery products, including fatty acids and derivatives, Plastolein plasticizers and Twitchell textile oils, in the New England area.

C T BURGESS will take over the sales duties vacated by Mr Clancy, which involve the states of Mississippi, Alabama, Georgia and the eastern section of the state of Tennessee.

Two additional men, E L SPENCER and E W SACK, were appointed to the sales staff. Mr Spencer was formerly associated with the Cincinnati Chemical Works. Mr Sack was transferred from Emery's Production Department where he has served as a department supervisor for the past 11 years.

JOSEPH L KEARNS, metropolitan salesman for A Gross & Co, manufacturers of fatty acids, has been awarded a $500 scholarship for advertising, publicity or marketing studies by the Advertising Club of New York.

The award was given as first prize in an essay contest conducted by the Advertising Club upon completion of its course in advertising and selling.

PAUL SNOWMAN now heads the Paper Chemical Division of the Aquex Development and Sales Corp, Whippany, N J, where he will also assist Aquex' chief chemist RAY SMITH in the preparation of textile finishing resins for synthetics.

Prior to joining Aquex, Mr Snowman served as development engineer and consultant for the Stevens Interests in Hoboken, N J.

THE MANUFACTURING CHEMISTS' ASSOCIATION recently announced the following committee appointments:

PAUL LOGUE, Monsanto Chemical Company, has been named chairman of the Association's Committee on Chemicals in Foods. New members appointed to this committee are HARRY A KUHN, Allied Chemical & Dye Corporation; PAUL D V MANNING, International Minerals & Chemical Corporation; ROTHE WEIGEL, Victor Chemical Works; and ERNEST W REID, Corn Products Refining Company.

E R BRUNSKILL, Cincinnati Chemical Works, has been appointed to the Association's International Trade and Tariffs Committee.

GEORGE KOCH, B F Goodrich Chemical Company, replaces MARCY OSBORNE on the Public Relations Advisory Committee, and ARTHUR NORTHWOOD, JR, Shell Chemical Corporation, replaces M H KEEL.